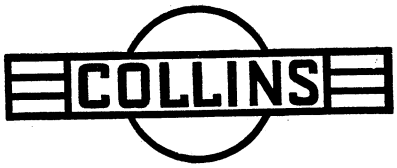

20 V 500/1000 WATT AM BROADCAST

TRANSMITTER

INSTRUCTION BOOK

INSTRUCTION BOOK

FOR

20V 500/1000 WATT AM BROADCAST

TRANSMITTER

MANUFACTURED BY

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA

520 9481 00

FEB 9 1951

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GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory in Cedar Rapids, Iowa, transportation prepaid, provided that the foregoing shall not be applicable to.

(a) Equipment or accessories as to which notice of the claimed defect is not given Collins within one year from date of delivery;

(b) Equipment and accessories manufactured by others than Collins, tubes and batteries, all of which are subject only to such adjustment as Collins may obtain from supplier thereof;

(c) Equipment or accessories which shall fail to operate in a normal or proper manner due to exposure to excessive moisture in the atmosphere or otherwise after delivery, any such failure not being deemed a defect within the meaning of the foregoing provisions.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins.

Notice of any claimed defect must be given to Collins prior to return of any item. Such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. Upon receipt of such notice, Collins will promptly advise respecting return of equipment. Failure to secure our advice prior to the forwarding of goods for return may cause unnecessary delay in the handling of such merchandise.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any cause.

HOW TO ORDER REPLACEMENT PARTS

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable:

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed:

(A) Quantity required
(B) Part number of item
(C) Item number (obtain from Parts List or Schematic Diagram)
(D) Type number of unit
(E) Serial number of unit
(F) Serial number of equipment

HOW TO RETURN MATERIAL OR EQUIPMENT

If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed:

(A) Date of delivery of equipment
(B) Date placed in service
(C) Number of hours in service
(D) Part number of item
(E) Item number (obtain from Parts List or Schematic Diagram)
(F) Type number of unit from which part is removed
(G) Serial number of unit
(H) Serial number of the complete equipment
(I) Nature of failure
(J) Cause of failure
(K) Remarks

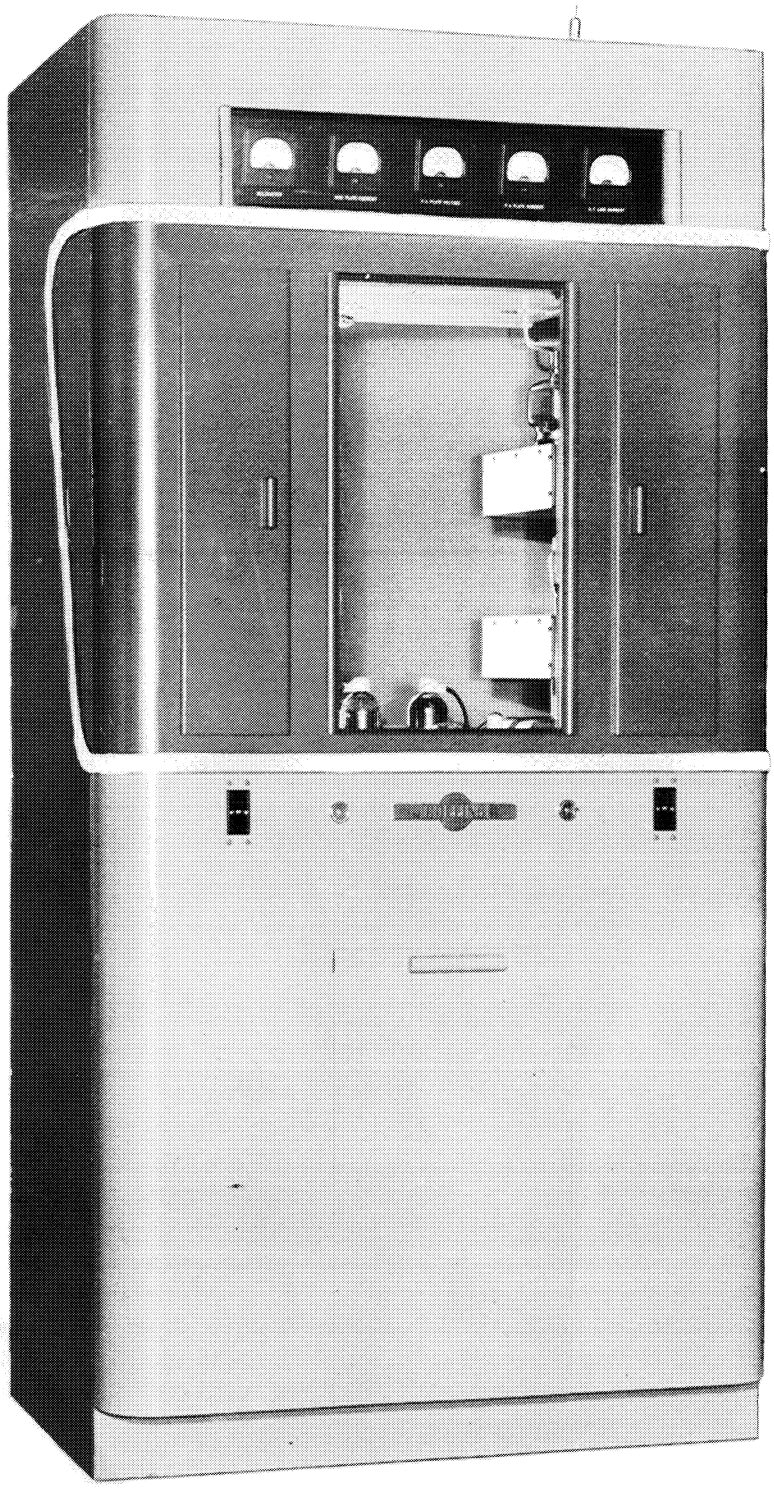

FIGURE 1-1 COLLINS 20V 1000 WATT AM TRANSMITTER

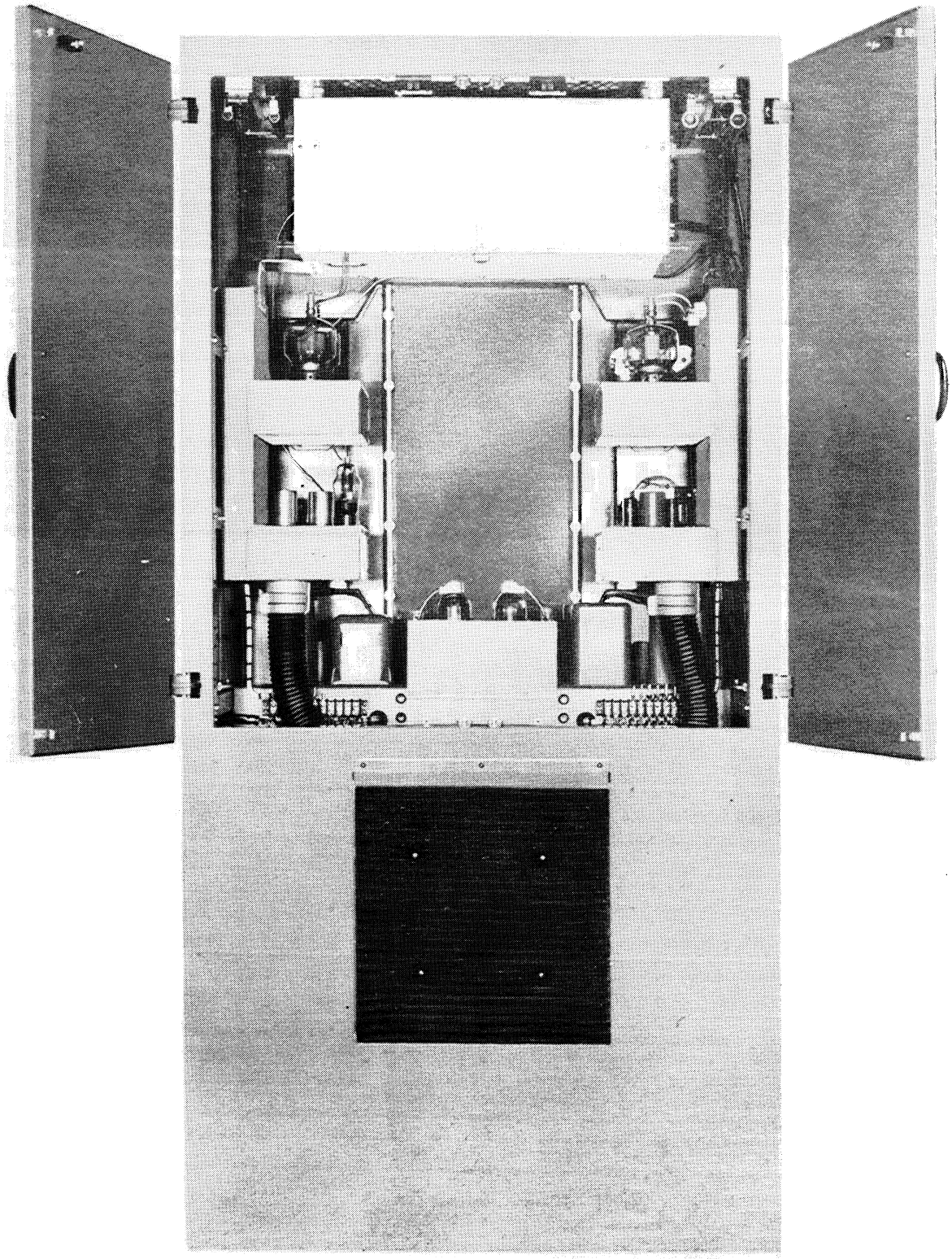

FIGURE 1-2 COLLINS 20V TRANSMITTER REAR VIEW

SECTION 1

GENERAL DESCRIPTION

1.1. GENERAL.

The Collins Type 20V 500/1000 Watt AM Transmitter, figure 1-1, has been designed particularly for high fidelity broadcast service. Advanced engineering techniques and new high quality components have combined to produce a transmitter which provides outstanding features designed to meet today's demand for better service from modern broadcast equipment.

1.2. MECHANICAL DESCRIPTION.

1.2.1. GENERAL. - The entire 20V transmitter is housed in one heavy gauge sheet metal cabinet neatly styled for impressive appearance. The complete equipment occupies a space 27" deep by 38" wide by 76" high. Its weight is approximately 1150 pounds. The heavier components, such as transformers, chokes and reactors are mounted on the floor of the transmitter cabinet. The audio and rf stages are housed in separate chassis which are designed for ease of servicing and maintenance. The two chassis are mounted on the right and left side respectively, as viewed from the rear of the cabinet. The amplifier plate circuit and the output network of the 20V are housed in a single shielded compartment which is suspended from the roof of the transmitter cabinet. The entire back panel of this rf compartment is easily removable providing access to the components within. The smaller transformers and the rectifier tubes are mounted on a power shelf which extends the width of the cabinet and which is located immediately behind the front panel of the transmitter. All tubes are easily visible through the large clear glass window on the front of the transmitter.

A removable panel on the lower front of the transmitter allows access to the power input terminals and the control relays. Two large rear doors, extending approximately 1/2 the length of the cabinet, allow access to the cabinet for servicing and maintenance. The lower half of the rear of the transmitter cabinet is covered by a removable panel which contains the permanent type air filter. Dual interlocks, both positive electrical and automatic mechanical in nature, are incorporated on both of the rear doors providing double protection to personnel. The electrical interlocks, which are of the split V type, open the primary circuits of the high and low voltage transformers whenever the rear doors are opened. The mechanical interlocks are designed to operate after the electrical interlocks have functioned. They ground the high voltage bus and discharge the high voltage filter capacitors.

All meters are mounted on a single illuminated panel which is located immediately above the window on the front of the cabinet. Their location enables operating personnel to operate the tuning controls while

observing the meter indications. The four bolts which secure the meter panel fit into slotted holes which allow the panel to be tilted at various angles.

1.2.2. CONTROL SYSTEM. - All operating controls for the 20V transmitter are conveniently located on the front of the cabinet. The FILAMENT ON-OFF and the PLATE ON-OFF switches are toggle type magnetically operated circuit breakers which are mounted on the left and right sides of the center of the cabinet, as viewed from the front, and immediately below the front window. The remainder of the controls and switches are mounted behind small vertical access doors which are located on either side of the front window. The right hand door provides access to the Crystal Selector Switch, the Crystal Frequency Trimmers, the Audio Hum Controls, the PA TUNING and the PA LOADING controls. The latter two controls position the variable tuning and loading capacitors by means of a flexible shaft drive assembly. The left hand door provides access to the MULTIMETER switch, the POWER CHANGE switch, the Modulator Bias Adjustments and the Audio Balance Control.

1.2.3. VENTILATION. - The necessary air for ventilating the 20V is drawn into the cabinet through a permanent type bronze air filter by means of a low speed, high volume blower. The entire cabinet is forced air cooled by means of the blower and in addition, the rf and audio chassis are pressurized by means of flexible air ducts leading directly from the blower. The air is exhausted through a shielded opening in the roof of the transmitter cabinet. The RF tank box acts as a dust baffle to prevent dust and dirt from settling into the cabinet during the periods the transmitter is not in operation.

1.3. ELECTRICAL DESCRIPTION.

1.3.1. GENERAL. - The 20V transmitter is provided with overload protection by means of the two magnetically operated circuit breakers associated with the FILAMENT ON-OFF switch and the PLATE ON-OFF switch. Further overload protection is afforded by means of fuses in the primary circuits of the filament, high voltage filament, low voltage, and bias supply transformers. A thermal time delay is provided in the filament circuits to preclude any possibility of energizing the low voltage and high voltage circuits before the filaments reach operating temperature.

Instantaneous power change is accomplished by simply rotating the POWER CHANGE switch inside the left hand access door on the front of the cabinet.

1.3.2. POWER SUPPLIES. - Excluding the filament supply, the 20V transmitter employs three power supplies: the high voltage, the low voltage, and the bias supply. The high voltage supply employs two type 872A half wave mercury rectifiers in a single phase full wave circuit. It furnishes the dc voltage for the plates of the Modulator and the plates and screens of the Power Amplifier tubes. The low voltage supply employs two type 866A half wave mercury rectifiers in a single phase full wave circuit. It furnishes the dc voltage for the plates and screens of the low power stages as well

as the dc voltage for the screens of the modulator tubes. The bias supply employs a single type 5U4G full wave high vacuum rectifier in a single phase full wave circuit. It furnishes bias to grids of the RF Driver, the Modulator and the Power Amplifier tubes.

1.3.3. AUDIO CIRCUITS. - The audio system in the 20V employs type 6SJ7 pentode tubes connected as push-pull triodes for the 1st Audio Amplifier and the Audio Driver stages. The Modulator stage employs two type 4-250A's operating in push-pull Class AB_1. A feedback loop to provide stability and noise reduction, is incorporated from the plates of the 4-250A's to the grids of the 6SJ7 1st Audio Amplifier.

1.3.4. R-F CIRCUITS. - The rf circuits of the 20V transmitter are straightforward circuits employing a type 6AU6 tube as the Oscillator, a type 6SJ7 tube as the Buffer, a type 807 tube as the RF Driver and two 4-400's in parallel as the Power Amplifier. The output network, consisting of a pi-section followed by an L section, is designed to feed into impedances between 50 and 72* ohms, and to provide a high degree of harmonic attenuation with minimum loss between the Power Amplifier and the transmission line.

The Oscillator, Buffer, and RF Driver plate circuits are contained within shielded, plug-in type units. They are easily removed or plugged into their respective sockets which are located behind the right front access door.

As a result of major advances in crystal stability and oscillator design, the 20V transmitter has eliminated the use of a crystal oven and its associated thermostats, relays and other controls. The highly perfected oscillator design in conjunction with new extremely stable, low temperature coefficient crystals has resulted in exceptionally good frequency stability. The 20V has provisions for mounting two crystals, with one of the two always available in a stand-by condition. The crystals are easily switched by means of the Crystal Selector switch located behind the lower inset panel on the right hand control panel.

Provisions have been made for frequency and modulation monitoring connections as well as a direct monitor speaker connection to allow on-the-air monitoring. A monitor amplifier may also be fed from this system.

1.4. SPECIFICATIONS.

(a) Power Output - 1000/500 watts.

(b) Audio Input Impedance - 600/150 ohms.

(c) R-F Output Impedance - 50/72 ohms.

(d) Power Source - 208/230 volts single phase, 50/60 cps.

(e) Power Demand - Approximately 4.15 kw at a power factor of 83% with 100% modulation.

* Other impedances are available.

(f) Weight - Approximately 1150 pounds.

(g) Dimensions - 38" wide, 76" high, and 27" deep.

SECTION 2

INSTALLATION

2.1. INSTALLATION.

2.1.1. PRELIMINARY.

(a) Unpacking. - Caution should be used when uncrating the transmitter and components to avoid damage to the equipment. All units should be inspected carefully. Inspect units for loose screws and bolts. Check all controls such as switches, etc., for proper operation as far as can be determined without the application of power. Inspect all cables and wiring and make sure all connections are tight and clear of each other and of the chassis. All claims for damage should be filed promptly with the transportation company.

(b) Location of the Transmitter. - It is recommended that the transmitter be placed in its permanent location before any of the units which were removed for shipping are replaced. The comparatively simple arrangement to accommodate the power and audio input, frequency monitoring, modulation monitoring and audio monitoring connections is illustrated in figure 2-1. The requirements of the illustration may be met by installing the necessary conduit in a concrete floor, or by installing a wiring trench of sufficient size. Another alternative would be to install a false floor under which the necessary wires and cables may be placed. The trench will have to accommodate a two wire power cable, a ground wire, two shielded twisted pairs, and two RG-8/U coaxial cables. It is also very desirable to have several ties from the transmitter cabinet to the building ground system.

Adequate clearance should be allowed in front of the transmitter for the operator to adjust the controls. There should be a clearance of 3-1/2 to 4 feet behind the unit to provide adequate ventilation and sufficient room to remove or install the units.

(c) Replacement of Units Removed for Shipping.

(f) Weight - Approximately 1150 pounds.

(g) Dimensions - 38" wide, 76" high, and 27" deep.

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(c) Replacement of Units Removed for Shipping.

(1) General. - Nine major and several smaller units are removed from the transmitter prior to shipment. The smaller units include the crystals, tubes, and rf output connector. The major units include the modulation reactor, L-111; the modulation transformer, T-105; the high voltage transformer, T-108; the two high voltage filter chokes; L-114 and L-115; the three high voltage filter capacitors, C-169, C-170, and C-184; and the dc blocking capacitor, C-163. Figures 7-5, 7-9, 7-12, and 7-15 illustrate the placement of these units.

Wires and cables that are removed from the units to which they connect are tagged before shipment. Should any of these tags become lost, refer to the cabling diagram for assistance in identifying such leads.

The procedure to be followed for the installation of the above mentioned units is as follows:

(2) Iron Core Units.

a. Before attempting to install the five heavy iron core units, L-111, L-114, L-115, T-105, and T-108, refer to figure 7-15 to determine their proper placement.

b. Note the terminal numbers on the front of all of the components. Record these numbers. Identification of these terminals is rather difficult once the units have been installed.

c. Remove the lower panel on the rear of the transmitter.

d. Install and secure the five units carefully in their proper positions on the floor of the transmitter.

e. A check of the nominal station voltage should be made at this time. The wires to the primary of the high voltage transformer, T-108, should be connected to the terminals which most nearly correspond to this voltage. Refer to figure 7-3 to determine the proper terminal numbers.

f. Refer to figures 7-3, 7-4, and 7-15, and to the tags on the cables and make all possible connections to the components at this time.

(3) Capacitors.

a. Install and secure the four capacitors, C-169, C-170, C-184, and C-163, in their proper positions as shown in figure 7-15.

b. Refer to figures 7-3, 7-4, and 7-15, and to the tags on the wires and cables and make all connections to the capacitors.

(4) RF Output Network Compartment.

a. Refer to Table 4-1 to determine the proper settings of the taps on coils L-108, and L-109 for the desired operating frequency and adjust the taps accordingly.

b. Replace the rear panel of the compartment.

(5) RF Cans. - There are three rf tank cans associated with the oscillator, buffer and rf driver plate circuits. Refer to figure 3-1 for their correct positions and install them in their proper sockets.

(d) Internal Connections. - Make all internal connections at this time. These include connection of inter-chassis cables and the connections to terminal boards E-101 and E-102. Refer to the cabling diagrams, figures 7-3 and 7-4 and to the tags on the wires to ascertain their proper location.

(1) If the nominal station voltage is very low, the 208 volt taps on the 872A filament transformer, the main filament transformer, and the low voltage plate supply transformer should be used. These 208 volt taps are wire leads that have been cabled with the other transformer leads. The bias supply transformer primary is not tapped, but a correction may be made for a very low nominal line voltage by changing the value of the bias supply bleeder resistor, R-174, from 2000 ohms to 2500 ohms. (See figure 7-16.)

(e) External Connections.

(1) Input Connections. - All input connections should be brought in through the grommeted holes in the bottom of the cabinet. (See figure 2-1.) A large convenient hand access hole is located on the floor of the transmitter to facilitate handling of the wires from the wiring trench.

a. Power. - Refer to the Installation Diagram, figure 2-1, for proper wire sizes. Bring the power lead and ground wire in through the large grommet in the floor of the transmitter and run them forward between the high voltage filter chokes to the front panel. Connect the two power wires to the two outer terminals on terminal board E-100. Connect the ground wire to the center terminal on E-100.

b. Audio Input. - The audio input connections are made to terminal board E-103 located within the lower shelf of the modulator chassis. Connect the two leads of a twisted shielded pair to the two outer terminals on E-103. Connect the center terminal to the shield.

(2) Monitoring Connections. - All monitoring connections are brought in through the smaller grommeted holes conveniently located between the heavy components and the cabinet wall. (See figure 2-1.)

a. Frequency Monitor. - Connect an RG-8/U coaxial cable to the frequency monitoring connector, J-104, which is located on the rf chassis.

b. Modulation Monitor. - Connect an RG-8/U coaxial cable to the modulation monitoring connection, J-100, which is located on the top of the rf output compartment.

c. Audio Monitor. - The audio monitoring connections are made to terminal board E-104 located in the rf chassis. Connect one wire of a twisted shielded pair to the terminal board. Connect the other wire and the ground shield to the remaining terminal.

(3) Transmission Line Connection. - The transmission line is connected to the short length of 7/8" rigid coaxial connector line which protrudes from the top of the transmitter cabinet. This connector is replaced through the hole in the top of the transmitter cabinet. The square metal plate on the lower part of the connector is attached by four screws. The brass strap on the feed-through insulator on the side of the RF network compartment is attached to the bottom of the coaxial connector.

(4) Remote Meter. - Holes are provided in the front portion of the RF tank box for mounting a bracket to hold the remote meter. This bracket (Collins Part Number 505 1831 002) may be obtained from the Collins Radio Company. The meter may also be obtained from Collins. Please state power output and antenna impedance when ordering.

(f) Tubes and Crystals. -

(1) Tubes. - All tubes have been removed from the transmitter prior to shipment. Place the tubes in their proper sockets as shown in figures 7-5, 7-9, and 7-12.

(2) Crystals. - Replace the two crystals in their sockets as shown in figure 7-12.

CAUTION

Extreme care should be exercised when handling the crystals. This new type of crystal is extremely fragile, more fragile than most vacuum tubes. The crystal may oscillate following rough handling but may have lost its highly important frequency vs. temperature characteristics.

TABLE 2-1. LIST OF WIRE SIZES AND TYPES

Letter	Type of Wire Code
A	AN-J-C-48
B	Busbar, Round Tinned Copper
C	JAN Type WL (600 volts)
D	Miniature JAN Wire
F	Extra-Flexible Varnished Cambric
G	General Electric Deltabeston
K	Neon Sign Cable (15,000 volts)
N	Single Conductor Stranded (Not Rubber)
P	Single Conductor Stranded (Rubber Covered)

Size of Wire Code (AWG)	
Letter	Size
A	22
B	20
C	18
D	16
E	14
F	12
G	10
H	8

Letter	Type of Wire Code
R	JAN Type SRIR (1000 volts)
V	JAN Type SRHV (2500 volts)

Size of Wire Code (AWG)	
Letter	Size
J	6
K	4
L	2
M	1
N	0
P	00
Q	000
R	0000

A typical example of the designation of inter-unit cabling used on the cabling schematic is as follows: If a wire emanating from terminal number 2 on unit A is to be connected to terminal number 6 on unit C, an arrow on the diagram at terminal number two on unit A would indicate C6 and a similar arrow at terminal number 6 on unit C would indicate A2.

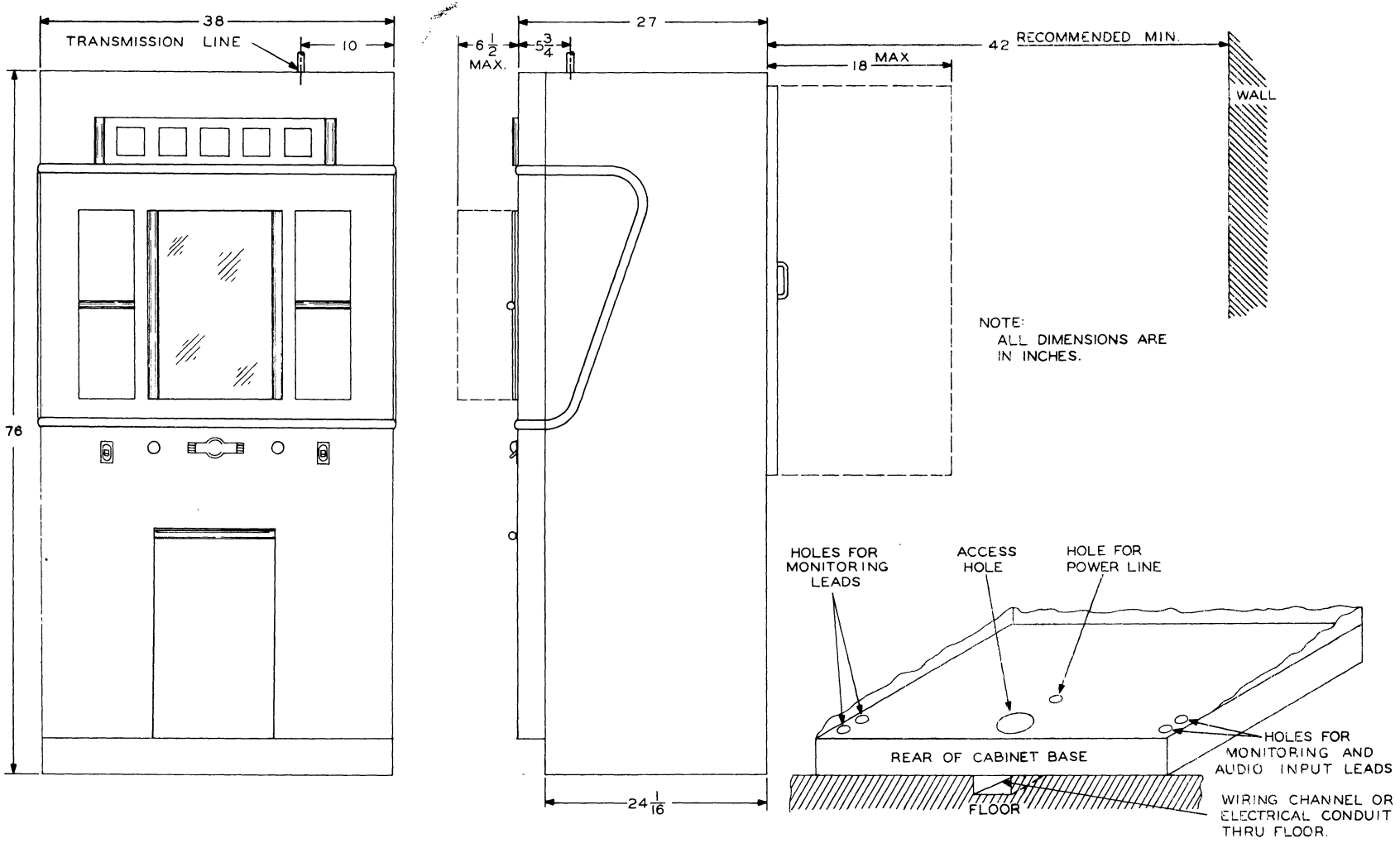
Color coding of wires is used to facilitate connecting cables to terminal strips. The code is indicated by a letter followed by a number. The letter designates the wire structure, size, amount and kind of insulation, and rating. The typical examples are shown below:

Unshielded Wire, JAN Type WL, #22 AWG, White with Red and Green Tracers.

C	A	9	25
Type of Wire	Size of Wire	Color of Body	Colors of Tracers

Shielded Wire, JAN type WL, #22 AWG, White with Red and Green Tracers

C	A	S	9	25
Type of Wire	Size of Wire	Shielded	Color of Body	Color of Tracers



CONNECTION	WIRE SIZES	RECOMMENDED WIRE
STATION POWER LINE SWITCH TO TRANSMITTER INPUT. (208/230V. SINGLE PHASE 50/60 CPS SOURCE. FUSED AT WALL CUT OUT BOX FOR 30 AMPERES) ____ ____ ____		TWO #6 WIRES
GROUND FEED (FURTHER BONDING OF CABINET TO BUILDING GROUND WOULD BE DESIRABLE) ____ ____ ____		ONE #4 (MIN) BARE WIRE
FREQUENCY MONITOR FEED ____ ____ ____		ONE RG-8/U COAXIAL CABLE

CONNECTION	WIRE SIZES	RECOMMENDED WIRE
MODULATION MONITOR FEED ____ ____ ____		ONE RG-8/U COAXIAL CABLE
AUDIO MONITOR FEED ____ ____ ____ ____		ONE 2 WIRE SHIELDED LEAD
AUDIO INPUT LEAD ____ ____ ____ ____ ____		ONE 2 WIRE SHIELDED LEAD
TRANSMISSION LINE ____ ____ ____		7/8" RIGID 50 OR 72 OHM COAXIAL CABLE

Figure 2-1. Typical Installation Diagram 20V Transmitter

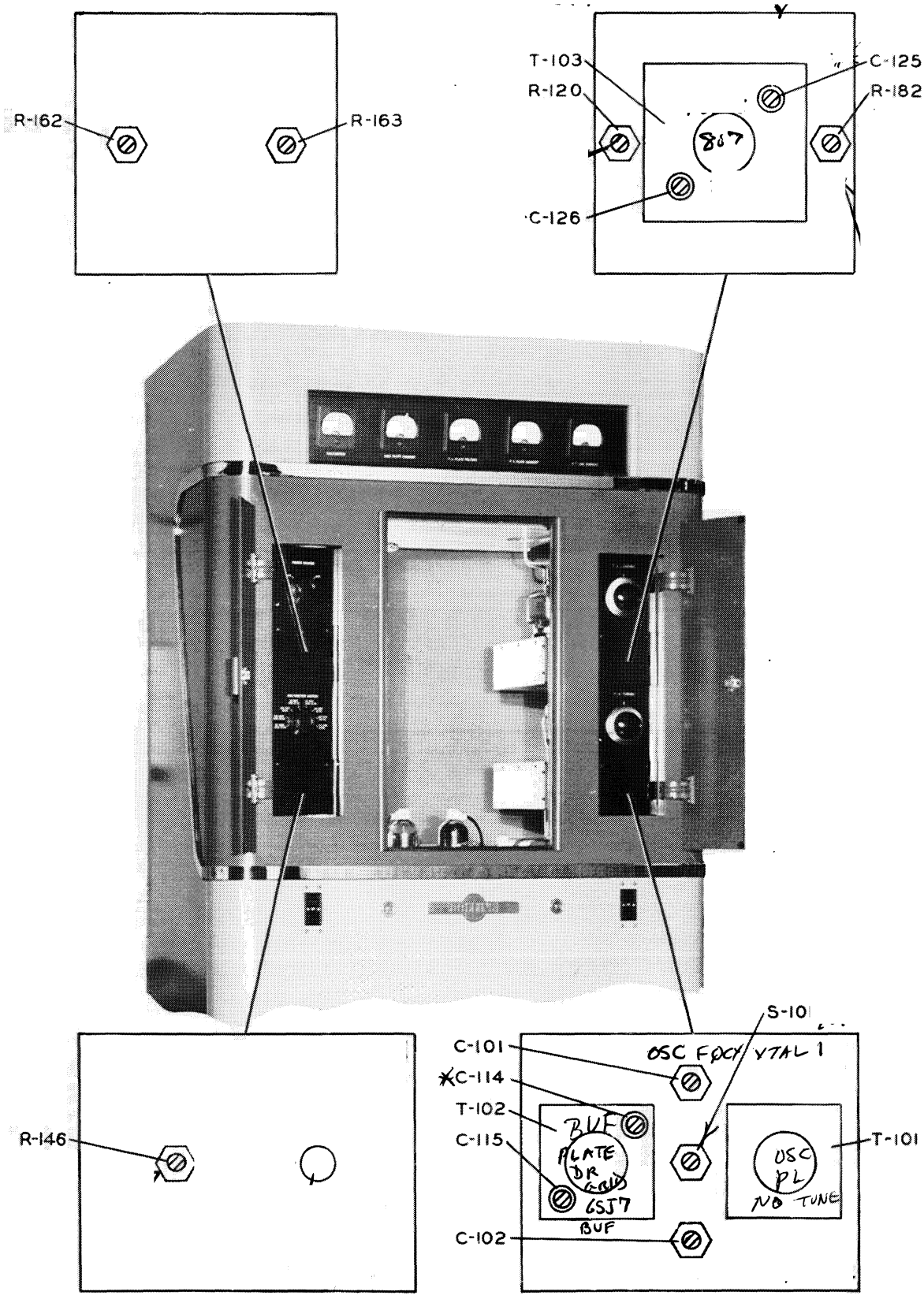


FIGURE 3-1 LOCATION OF CONTROLS BEHIND INSPECTION PLATES

Section 3

ADJUSTMENT AND OPERATION

3.1. INITIAL ADJUSTMENT.

3.1.1. LOCATION OF CONTROLS. (Refer to figures 3-1 and 7-14.) - The 20V controls are all accessible from the front of the transmitter. With the doors closed, only the FILAMENT ON-OFF switch (left) and the PLATE ON-OFF switch (right) and the FILAMENT ON and PLATE ON pilot lamps are visible.

With the two access doors open, the POWER CHANGE switch, and the MULTIMETER switch on the left and the PA TUNING and PA LOADING controls on the right are accessible. These are the controls most used in normal operation.

For further adjustment on the transmitter, there are controls mounted behind small removable covers located on the control panels. Removing the upper left cover exposes the Modulator Bias adjustments. Removing the lower left cover exposes the Audio Balance control. Removing the upper right cover exposes the RF Driver plate tank can and the Audio Hum adjustments. Removing the lower right cover exposes the two crystal trimmer adjustments, the Crystal Selector switch and the Oscillator and Buffer plate circuit rf cans.

3.1.2. FUNCTION OF CONTROLS. -

(a) CIRCUIT BREAKERS AND SWITCHES. (Refer to figure 7-14 for location.) -

(1) FILAMENT ON-OFF Switch. - The FILAMENT ON-OFF switch, S-106, is a toggle type magnetically operated circuit breaker. When placed in the ON position, it energizes the filaments, the bias supply, the blower motor, the thermal time delay and the lumiline meter lights. The thermal time delay relay, K-101, has a delay period which is adjustable from 10 to 45 seconds. At the end of this period and provided all interlocks are closed, the plate contactor relay coil, K-102, is energized closing the plate contactor and bringing on the FILAMENT ON pilot lamp indicating a readiness for plate power.

(2) PLATE ON-OFF Switch. - The PLATE ON-OFF switch, S-107, is a toggle type magnetically operated circuit breaker similar to the FILAMENT ON-OFF switch. It energizes the high and low voltage transformer primaries provided, however, that the filaments have been on the required length of time and that the plate contactor, K-102, is closed. If desired, the FILAMENT ON-OFF switch and the PLATE ON-OFF switch may be thrown to the ON position at the same time. In this case the high and low voltage supplies will come on automatically at the end of the filament time delay and the PLATE ON pilot lamp will glow indicating that full operating condition has obtained.

(3) MULTIMETER Switch. - The MULTIMETER switch, S-102, is a two pole eight position switch which inserts the MULTIMETER, M-104, into the various circuits which are to be metered. Provisions are made to use the MULTIMETER for metering the cathode currents of the Oscillator, Buffer, RF Driver, 1st Audio and the Audio Driver stages, and the grid currents of the Buffer, RF Driver and Power Amplifier stages.

(4) POWER CHANGE switch, S-103, provides for a power change from 500 to 1000 watts. For full power operation at 1000 watts output, the POWER CHANGE switch shorts out the dropping resistance which is in series with the high voltage lead and allows the full high voltage to be applied to the Power Amplifier tube plates.

(5) Crystal Selector switch. - The Crystal Selector switch, S-101, is a screwdriver adjustment which selects the crystal to be inserted into the oscillator circuit. When the switch is turned to the left, the crystal on the left side of the chassis, Y-101 is placed in operation.

(b) ADJUSTMENT CONTROLS. (Refer to figure 3-1.) -

(1) Modulator Bias Control. - The Modulator Bias controls, R-162 and R-163, are screwdriver adjustments which adjust the amount of negative bias applied to the grids of the Modulator tubes. Turning the controls clockwise increases the amount of bias applied to the tubes. The left hand control is the bias adjustment for the front modulator tube and the right hand control is the bias adjustment for the rear modulator tube.

(2) Audio Balance Control. - The Audio Balance control, R-146, is a potentiometer in the cathode circuit of the Audio Driver stage. Its function is to decrease the distortion caused by unbalance in the audio section of the transmitter.

(3) Audio Hum Controls. - Audio Hum Control A, R-182, is used to adjust the drive to the power amplifier for minimum ac noise level.

Audio Hum Control B, R-120, is a potentiometer connected across the filaments of the Power Amplifier stage. It is a screwdriver adjustment which minimizes the hum caused by the ac filament voltage

and low voltage rectifier tubes, V-113 through V-116, making sure that they hang free and are not near or touching any metal parts of the transmitter.

Inspect all door interlocks making certain that the male member is free by pressing on the contact blocks until the spring is completely compressed and then releasing the pressure. If the contact blocks do not spring out to their original position check the interlock carefully and adjust it until it operates properly.

Using an ohmmeter, check for continuity between terminals 2 and 3 on terminal board E-101. These terminals connect to the door interlocks, S-108 and S-109. The meter should indicate an open circuit when either one or both of the rear doors are open. Check for continuity between terminals 1 and 3 on terminal board E-101. These terminals connect to the blower interlock, S-110. The meter should indicate an open circuit. Now, lift the arm of the blower interlock and again check for continuity between terminals 1 and 3. The meter should now indicate a short circuit.

(b) Power Circuit Check. - Having checked the interlocks and connections as in paragraph 3.1.3.(a) above, proceed with the check of the Power circuit as follows:

(1) Close all of the cabinet doors tightly.

(2) Throw S-106, the FILAMENT ON-OFF switch, to the ON position. The lumiline meter lights, the filaments, the blower motor, and the bias supply should all come on instantly. Approximately 30 seconds later, the thermal time delay relay, K-101, should close energizing the plate contactor relay, K-102. The thermal time delay is adjustable from 10-45 seconds by means of R-171. In the event the delay period is longer or shorter than 30 seconds, adjust R-171. Turn R-171 to the left to shorten the time delay period and to the right to lengthen it. Any check of the period should be performed from a cold start since the relay will operate more quickly if it is still warm from a previous trial. The FILAMENT ON pilot lamp should come on as soon as the plate contactor relay is energized. When the plate contactor relay is energized, it readies the circuits for the application of plate power. The bias supply may be checked by opening one of the rear doors and checking the voltage from terminal 9 on E-101 to ground. It should be approximately 110 volts negative with respect to ground.

(3) Throw the PLATE ON-OFF switch, S-107, to the ON position. The PLATE ON pilot lamp should come on immediately.

(4) This completes the power circuit check. If any difficulty is encountered in obtaining the results specified in the procedures above, refer to Section 5, Corrective Maintenance.

(5) Throw the FILAMENT ON-OFF switch and the PLATE ON-OFF switch to the OFF position.

3.1.4. MERCURY VAPOR RECTIFIER TUBES. - To permit the proper conditioning of mercury vapor rectifier tubes, the filaments should be excited for a period of twenty minutes before the application of any plate power. This can be accomplished by allowing one of the cabinet doors to remain open with the filaments of the tubes excited, thus preventing the operation of the power control relay during the conditioning process. This aging procedure is required only in the case of new tubes or of old tubes which have been agitated or inverted and then replaced. This aging process is necessary in order to remove the mercury coating from the elements. If it is desired to have replacement rectifier tubes available for immediate use, they should be inserted in the equipment, aged, and carefully removed and stored in an upright position until needed. With short interruptions in service, not necessitating a change in rectifier tubes, the time delay relay will automatically provide an adequate time interval. If a cold rectifier tube is placed in the equipment, it is recommended that the filament power be on for at least 20 seconds before the application of plate power.

3.1.5. TUNING ADJUSTMENT. -

(a) Alignment of rf Section. -

(1) Remove the modulator tubes from the equipment, and recheck to see that the plate cap leads of the high voltage rectifier tubes, V-113 and V-114, are still hanging free. The low voltage rectifier tube plate caps should be replaced on their respective tubes, V-115 and V-116.

NOTE

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE PROPER SAFETY PRECAUTIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE OF THE EQUIPMENT WITH THE HIGH VOLTAGE APPLIED. DO NOT DEPEND UPON THE DOOR INTERLOCKS FOR PROTECTION. ALWAYS SHUT DOWN EQUIPMENT WHEN MAKING ADJUSTMENTS.

(2) Rotate the Crystal Selector switch, S-101, to the desired position.

(3) Throw the FILAMENT ON-OFF and PLATE ON-OFF switches, S-106 and S-107, to their ON positions.

(4) Rotate the MULTIMETER switch, S-102, to the first four positions and check the MULTIMETER readings with those given in table 3-1. The full scale reading of the MULTIMETER is indicated for each position of the MULTIMETER switch.

(5) Rotate the MULTIMETER switch to the position designated 807 GRID, 25 MA. The 807 RF Driver grid current will have to be adjusted for a peak reading by adjusting the Buffer plate tank trimmer capacitors, C-114 and C-115. The Buffer plate circuit is mounted in the left hand rf can located behind the lower right insert cover.

NOTE

TO OBTAIN MAXIMUM FREQUENCY COVERAGE PER CAN IN THE AM BROADCAST BAND, THE TRIMMING CAPACITORS ARE IN PARALLEL. SET ONE CAPACITOR IN A POSITION THAT GIVES A GOOD TUNING RANGE WITH THE OTHER CAPACITOR. SEAL THE FIRST CAPACITOR OPENING WITH SCOTCH TAPE.

TABLE 3-1. TYPICAL METER READINGS

Switch	Switch Position	Meter	Meter Reading
MULTIMETER SWITCH	1ST AUDIO CATH. 25 MA.	MULTIMETER	4 ma.
MULTIMETER SWITCH	2ND AUDIO CATH. 25 MA.	MULTIMETER	14 ma.
MULTIMETER SWITCH	OSC. CATH. 25 MA.	MULTIMETER	4 ma.
MULTIMETER SWITCH	1ST BUFF. GRID. 2.5 MA.	MULTIMETER	0.1 ma.
MULTIMETER SWITCH	1ST BUFF. CATH. 25 MA.	MULTIMETER	6.5 ma.
MULTIMETER SWITCH	807 GRID 25 MA.	MULTIMETER	1 ma.
MULTIMETER SWITCH	807 CATH. 250 MA.	MULTIMETER	55 ma.
MULTIMETER SWITCH	P.A. GRID 25 MA.	MULTIMETER	20 ma.
POWER CHANGE	LOW (550 w)	MOD. PLATE CURRENT	
		static	120 ma.
		100% mod.*	320 ma.
POWER CHANGE	LOW (550 w)	P.A. PLATE VOLTAGE	2200 volts
POWER CHANGE	LOW (550 w)	P.A. PLATE CURRENT	330 ma.
POWER CHANGE	LOW (550 w)	R.F. LINE CURRENT	
		70 ohm antenna	2.8 amps
		50 ohm antenna	3.3 amps
POWER CHANGE	HIGH (1100 w)	MOD. PLATE CURRENT	
		static	120 ma.
		100% mod.*	450 ma.
POWER CHANGE	HIGH (1100 w)	P.A. PLATE VOLTAGE	3100 volts
POWER CHANGE	HIGH (1100 w)	P.A. PLATE CURRENT	500 ma.
POWER CHANGE	HIGH (1100 w)	R.F. LINE CURRENT	
		70 ohm antenna	3.95
		50 ohm antenna	4.7

* With 1000 cycle sine wave.

(6) Turn the MULTIMETER switch to the position designated 1st BUFFER CATHODE, 25 MA, and check the reading with those given in Table 3-1.

(7) Turn the MULTIMETER switch to the position designated PA GRID, 25 MA. Adjust the two Driver plate trimmer capacitors, C-125 and C-126, in the same manner as described above, to obtain maximum Power Amplifier grid current as indicated on the MULTIMETER.

(8) Throw the PLATE ON-OFF switch, S-107, to OFF and replace the plate caps on the high voltage rectifier tubes, V-113 and V-114.

(9) Replace the Modulator tubes and turn the two bias adjustment controls, R-162 and R-163, to their maximum clockwise position. This should be maximum negative bias as indicated by a decrease in Modulator Plate current.

(10) Adjust the clip on the modulation monitoring coil, L-110, located in the rf compartment, to a position near the ground end of the coil.

(b) Power Amplifier Plate Tuning and Loading.

(1) Turn the POWER CHANGE switch, S-103, to the LOW position.

(2) Set PA LOADING at minimum by turning the PA LOADING control, C-147, to 100 on the dial.

(3) Throw FILAMENT ON-OFF and PLATE ON-OFF switches to their ON positions.

(4) As soon as the PLATE ON pilot lamp comes on, adjust the PA TUNING control, C-146, for minimum Power Amplifier plate current as indicated on PA PLATE CURRENT meter, M-102.

(5) Turn the MULTIMETER switch to the position designated PA GRID, 25 MA, and retune the 807 RF Driver plate tank for maximum Power Amplifier grid current as indicated on the MULTIMETER.

(6) Adjust the Modulator Bias Adjustment controls in the following manner. Visually observe the color of the modulator tubes and adjust the two controls, R-162 and R-163, until the two tubes appear to have the same color, making certain that after the final adjustments, the total plate current remains at 120 ma.

(7) Turn the POWER CHANGE switch, S-103, to the HIGH position.

(8) Immediately make certain the the Power Amplifier is tuned to resonance. If not, adjust the PA TUNING control to obtain minimum plate current as indicated on PA PLATE CURRENT meter, M-102.

(9) Retune the 807 RF Driver plate tank circuit, if necessary. (See step (5) above.)

(10) Increase the loading by reducing the capacity of the PA LOADING capacitor, C-147, while simultaneously retuning the Power Amplifier plate circuit to resonance by means of the PA TUNING control. The type of output network employed in the 20V detunes the plate circuit as the loading is changed thereby causing the plate current to soar. The best procedure in loading is to adjust the two controls simultaneously as mentioned above. However, it may also be accomplished by first increasing the loading slightly, then retuning the plate circuit to resonance, and repeating this procedure until the RF Line current, as indicated on M-101, is slightly less than the amount necessary to obtain the desired power output, when the Power Amplifier plate circuit is in resonance.

(11) Detune the Power Amplifier plate circuit very slightly to the side of resonance which yields an increase in the RF LINE CURRENT meter reading. The Power Amplifier plate current will also increase slightly; however, the increase in power to the rf line will be greater than the increase in Power Amplifier input power, thus yielding a higher plate efficiency.

(12) Adjust the PA LOADING and PA TUNING controls to the point where the desired amount of RF Line Current is obtained with the highest operating efficiency. This will always result with the Power Amplifier plate circuit slightly detuned.

(c) Audio Adjustments. - There are only five adjustments which need to be made in regard to audio frequencies. These include the two Modulator Bias Adjustments, the Cathode Balance control in the Audio Driver stage, and the audio hum adjustments. The following adjustments are to be made with the transmitter operating as in paragraph 3.1.5.(b)(12) above.

NOTE

BEFORE PROCEEDING WITH STEP (1) BELOW, IT WILL BE NECESSARY TO READJUST THE MODULATION MONITORING TAP ON L-110 TO OBTAIN THE DESIRED OUTPUT TO THE MODULATION MONITORING EQUIPMENT.

(1) Distortion. - Inject a 1000 cycle signal of sufficient amplitude to modulate the rf carrier 95%. Adjust the Cathode Balance control, R-146, and the two Modulator Bias adjustment controls R-162 and R-163, to obtain minimum distortion as indicated on a distortion analyzer, without exceeding the 120 ma static plate current of the two modulator tubes.

(2) Hum and Noise. - Inject a 1000 cycle audio signal of sufficient amplitude to modulate the rf carrier 100%. Calibrate the noise meter and remove the modulation, and read the noise level. Adjust Audio Hum Control A, located to the right of the 807 plate tank, for minimum noise. Adjust Audio Control B, located to the left of the 807 plate tank, to further reduce the amplitude of the noise level.

3.2. ROUTINE OPERATION.

3.2.1. GENERAL. - The steps outlined in this section may be used as a guide to routine operation of the equipment, subsequent to completion of the initial adjustments. It is suggested that the operator refer to the adjustment section of this instruction book, paragraph 3.1.(a) through 3.1.(b) for a more detailed explanation in regard to the adjustment of the transmitter circuits. Control knobs and meter locations are shown in figure 7-14. It is assumed in the following procedures that the main station power switch is in the ON position.

3.2.2. STARTING THE EQUIPMENT.

(a) Check first to see that all doors are closed, and then throw the FILAMENT ON-OFF switch to the ON position.

(b) Check to see that the POWER CHANGE switch is in the proper position for the desired power output.

(c) Check to see that the desired crystal is in the circuit. The left hand crystal is selected when the switch is thrown to the left. The right hand crystal is selected when the switch is thrown to the right.

(d) Throw the PLATE ON-OFF switch to the ON position.

(e) Check the Power Amplifier plate current, the RF Line current, the Modulator cathode current, and the currents at all positions of the MULTIMETER switch. Check the PA plate voltage. Refer to Table 3-1 for typical meter readings.

(f) Make all necessary monitoring observations.

3.2.3. POWER CHANGE. - The power output of the 20V may be changed from 1000 watts to 500 watts by merely turning the POWER CHANGE switch to the LOW position. Minor corrections in power output are made by means of the PA TUNING and PA LOADING controls. It is not necessary to shut the plate power off during the change.

SECTION 4

CIRCUIT DESCRIPTION

4.1. ELECTRICAL DESCRIPTION.

4.1.1. PRIMARY POWER CIRCUITS.

(a) Filament, Blower, Bias, and Control Circuits. - With the FILAMENT ON-OFF switch in the ON position, 230 volts are applied to the primary windings of the two filament transformers, T-107 and T-109, the primary winding of the bias transformer, T-106, the blower motor, B-101, the lumiline meter lights, I-102 and I-103, and the thermal time delay, K-101.

(1) Control Circuits. - As seen from figure 7-2, the instant the FILAMENT ON-OFF switch is thrown to the ON position, voltage is impressed across the thermal relay. The thermal time delay relay, K-101, contains a small heating element and a set of contacts. The amount of resistance in series with the relay governs the amount of current flowing through it and hence the length of time required to heat the relay to the point where the contacts close. At the end of its delay period, which is adjustable from 10 to 45 seconds by means of R-171, the contacts close. If the door and blower interlocks are closed, the plate contactor relay, K-102, will now be energized. The plate contactor relay, K-102, performs two main functions. It places a shunt resistor, R-172, across the thermal relay, lowering the voltage applied to the thermal relay heater and, also, completes the circuit between the PLATE ON-OFF breaker, S-107, and the primaries of the high and low voltage transformers, T-108 and T-110. It also shorts the time delay relay contacts.

The thermal time delay relay, which contains a heater, a bi-metallic strip, and a set of contacts, operates in the following manner to provide a time delay period which is dependent on the tube filament temperature. The temperature within the relay, as controlled by the heater, affects the bi-metallic element which operates to open or close the relay contacts. If the power is removed for an instant and then returned, there will be not filament time delay period since the element will not have cooled to the point where the contacts have opened. Likewise, the filaments will not have cooled to the point where a warm-up period is necessary. This is a distinct advantage over a motor operated relay which provides a set delay period regardless of the temperature of the tube filaments. The motor operated relay will prevent return to the air until the entire time delay period has elapsed whether there is an instantaneous power interruption, or whether the power has been removed for several hours. The thermal time delay relay then provides the quickest possible return to the air after a power interruption.

FREQ.	C-146 APPROX. DIAL READ.	L-108 TURNS* FROM END	C-148 uuf	C-149 uuf	C-150 uuf	C-151 uuf	C-147** APPROX. DIAL READ.	L-109 TAPS*** USED
550	60	0	800	2000	800	800	60	1-8
600	55	1	800	2000	800	400	50	1-8
650	25	2	800	2000	800	400	35	1-8
700	10	3	800	2000	800	OUT	20	1-8
750	10	5	OUT	2000	800	OUT	50	1-8
800	30	0	800	800	800	800	15	1-8
850	28	1	800	800	800	800	50	2-7
900	22	2	800	800	800	800	20	2-7
950	10	3	800	800	800	800	10	2-7
1000	20	5	800	800	400	400	55	2-7
1050	20	6	800	800	400	400	40	2-7
1100	15	7	800	800	400	400	30	2-7
1150	15	8	800	800	400	400	15	2-7
1200	12	9	800	800	400	400	35	2-7
1250	23	10	800	800	400	OUT	75	3-6
1300	75	5	400	400	400	OUT	45	3-6
1350	80	6	400	400	400	OUT	32	3-6
1400	80	7	400	400	400	OUT	32	3-6
1450	70	7	400	400	400	OUT	30	3-5
1500	70	8	400	400	400	OUT	30	3-5
1550	65	8	400	400	400	OUT	60	3-5
1600	75	9	400	400	400	OUT	60	3-5
1650		9						
1700		10						

NOTES:

* Number of turns shorted at each end.

** For 72 ohm output. Readings for 50 ohm output will be somewhat higher.

*** Taps are numbered from top to bottom, 1 to 8.

Table 4-1. 20V Output Tank Tuning Data

FREQUENCY	L-108	C-145	C-148	C-149	C-150	C-151
550-590	150 uh	400 uuf	800 uuf	2000 uuf	800 uuf	800 uuf
600-790	150 uh	400 uuf	800 uuf	2000 uuf	800 uuf	400 uuf
800-990	81 uh	400 uuf	800 uuf	800 uuf	800 uuf	800 uuf
1000-1290	81 uh	400 uuf	800 uuf	800 uuf	400 uuf	400 uuf
1300-1600	81 uh	0	400 uuf	400 uuf	400 uuf	0

Table 4-2. 20V Output Tank Components for 50 or 72 Ohm Resistive Load.

(b) High and Low Voltage Circuits. - Throwing the PLATE ON-OFF switch to the ON position impresses 230 volts across the primary windings of the high and low voltage transformers T-108 and T-110, provided, however, that the plate contactor relay has been energized. Illumination of the FILAMENT ON lamp indicates a readiness for plate power.

4.1.2. RF SECTION. - The rf portion of the 20V transmitter is composed of straightforward rf circuits which include the following:

(a) Oscillator. - (Refer to figure 7-1.) The crystal oscillator, V-101, is a type 6AU6 pentode connected in a Pierce oscillator circuit. The inherent stability of the Pierce circuit combined with the new low temperature coefficient crystals has eliminated the need for a crystal oven. For frequencies in the AM broadcast band, the oscillator employs a resistance load. Since the 20V is also available for high frequency applications, the resistive load may be replaced by a tuned tank circuit for frequency doubling.

(b) Buffer Amplifier. - (Refer to figure 7-1.) The buffer stage, V-102, employs a type 6SJ7 tube operating as a Class C amplifier. The plate tank circuit is composed of L-102, C-114, C-115, and C-113. The Buffer operates as a straight amplifier in the AM broadcast band. (See

table 4-3 for schematic diagram of the buffer tank for the various frequency ranges.) For high frequency applications it may operate as a doubler stage.

(c) RF Driver Amplifier. - (Refer to figure 7-1.) The Driver stage, V-103, employs a type 807 tube operating as a Class C amplifier. The plate circuit is composed of L-104, C-124, C-125, and C-126. The Driver operates as a straight amplifier for all applications. (See table 4-3 for a schematic diagram of the driver tank for the various frequency ranges.)

(d) Power Amplifier. - The Power Amplifier, V-104 and V-105, employs two type 4-400A tetrodes connected in parallel and operating Class C. Although neutralization is unnecessary in the AM broadcast band, provisions have been made for connecting a neutralizing capacitor, C-131, from the Power Amplifier plate to the low end of the grid tank circuit when needed in the higher frequency applications. A resistor, R-121, connected in the cathode circuit of the Power Amplifier, acts as a low impedance source for feeding a monitor speaker or amplifier system.

The plate circuit is composed of a "pi-section" followed by an "L section". The variable tuning and loading capacitors are positioned from the front panel by means of flexible shaft drives.

The coil, L-110, acts as a static drain and as a voltage source for feeding the modulation monitor. It is connected from the output end of the "L section" to ground.

4.1.3. AUDIO CIRCUITS. - The audio circuits employed in the 20V are also of straightforward design requiring no detailed description. Only the salient points of each circuit are mentioned.

(a) 1st Audio Amplifier and Audio Driver. - The first two audio stages, V-106 through V-109, employ type 6SJ7 pentodes connected as triodes and operating as Class A push-pull amplifiers. The input circuit to these stages consists of a terminating pad feeding the primary of the audio input transformer, T-104. An audio balance control, R-146, is connected in the cathode circuit of the Audio Driver stage.

(b) Modulator. - The modulator stage, V-110 and V-111, employs two type 4-250A tetrodes operating Class AB_1 in a push-pull circuit. Approximately 12 db of feedback is provided from the plates of the Modulator stages to the grids of the 1st Audio Amplifier.

4.1.4. FILAMENT SUPPLIES. - Filament power for the bias supply rectifier tube and the high voltage supply rectifier tubes is supplied by T-106 and T-107 respectively. The remainder of the tubes obtain their filament power from the filament transformer T-109.

4.1.5. PLATE AND BIAS SUPPLIES.

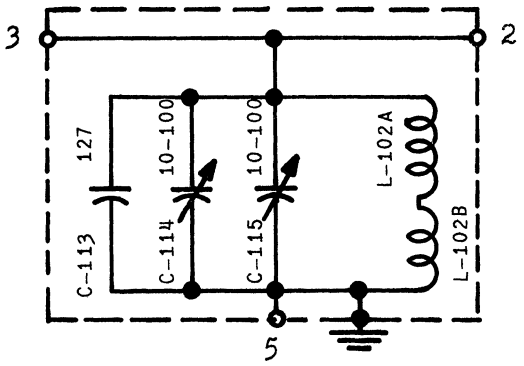
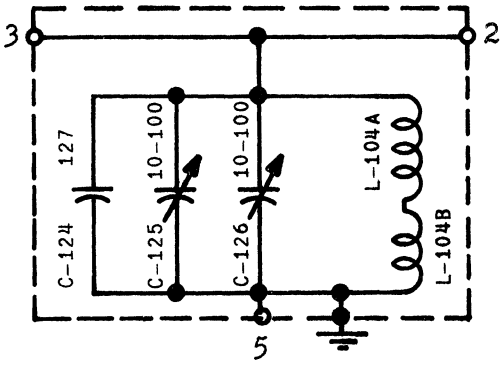
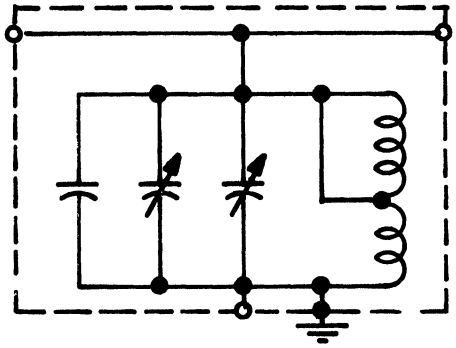
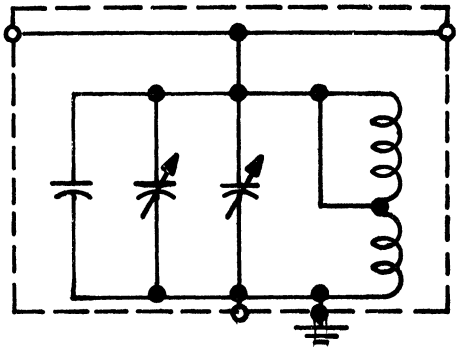
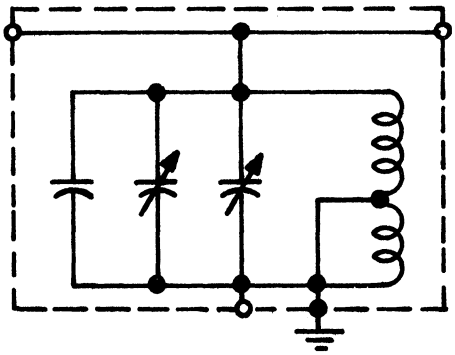
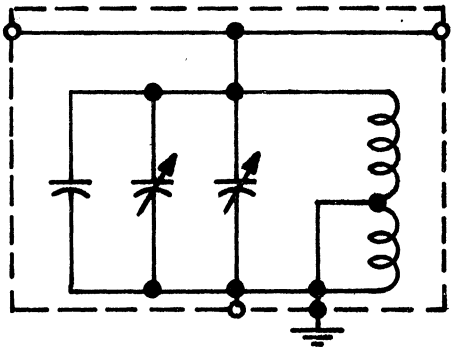
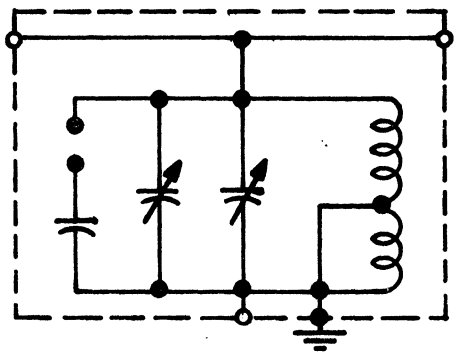
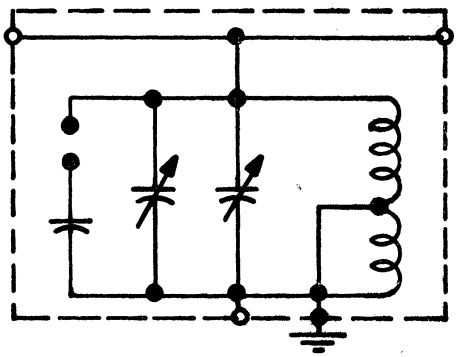
FREQUENCY RANGE	BUFFER PLATE TANK CIRCUIT (T-102)	DRIVER PLATE TANK CIRCUIT (T-103)
550 kc to 700 kc		
700 kc to 950 kc		
950 kc to 1100 kc		
1100 kc to 1600 kc		

Table 4-3 T-102 and T-103 Internal Connections

(a) High Voltage Supply. - The high voltage supply utilizes a pair of 872A half-wave mercury vapor rectifier tubes in a single phase full wave rectifier circuit. The output of the single section choke input filter is 3100 volts at 1 amp. The filter is composed of two chokes, L-114 and L-115, in series, which are followed by two capacitors, C-170 and C-184, connected in parallel to ground. The first choke, L-114, is tuned by means of C-169 to form a parallel resonant circuit at the ripple frequency. This supply furnishes the plate voltage for the plates of the Modulator and Power Amplifier tubes as well as the screen voltage for the Power Amplifier tubes.

(b) Low Voltage Supply. - The low voltage supply consists of a pair of type 866A half wave mercury vapor tubes in a single phase, full wave, rectifier circuit. The output from the two section choke input filter is 550 volts at 250 ma. With the exception of the plates and screens of the Power Amplifier and the plates of the Modulator tubes, the low voltage supply furnishes the plate and screen voltage for all tubes in the equipment.

(c) Bias Voltage Supply. - The bias supply employs a type 5U4G full wave high vacuum rectifier tube in a single phase full wave circuit. It utilizes a two section choke input filter and is capable of delivering a negative 110 volts at 80 ma. It supplies bias voltage to the Modulator, RF Driver, and the Power Amplifier stages.

SECTION 5

MAINTENANCE

This transmitter has been constructed of materials considered to be the best obtainable for the purpose, and has been carefully inspected and adjusted at the factory to reduce maintenance to a minimum. To insure peak performance and prevent the failure or the impairment of the operation of the equipment, a definite schedule of routine periodic checks and maintenance procedures should be adhered to.

5.1. CLEANING.

5.1.1. GENERAL. - The greatest enemy to uninterrupted service in equipment of this type is corrosion and dirt. Corrosion is accelerated by the presence of dust and moisture. It is impossible to keep moisture out of the equipment in certain localities, but foreign particles and dust can be periodically removed by means of a soft brush or a dry oil-free jet of

air. Although the cabinet is equipped with a dust filter which will remove most of the dust particles, there is always a slight accumulation of dust in the vicinity of circuits maintained at a high potential above ground. Remove dust as often as a perceptible quantity accumulates at any place in the equipment. It is very important the capacitors, tap switches, etc., be kept free from dust so as to prevent undue wear. In general, it will be found that contacts such as the tap switches, tube prongs and cable plug connectors are most affected by corrosion. When it is necessary to operate the equipment in localities where corrosion is a problem, e.g. near salt water, inspection of wiping contacts, cables, plugs, and relays, etc., should be made more frequently in order to keep the equipment in good condition.

* TAP CONNECTORS, RF, YOU MEAN?

5.2. AIR FILTER.

The bronze air filter will give more satisfactory life if it is cleaned approximately once every two weeks. A small vacuum cleaner is a satisfactory means of removing the surface dirt. Whenever the bronze element appears to be clogged appreciably by dirt and grease, the filter should be removed, washed in carbon tetrachloride and then recharged by immersing it in SAE #30 oil, and allowing all excess oil to drain off.

5.3. LUBRICATION.

Lubricate the bearings of the blower motor with No. 10 oil. Use only a small amount at one time since too much oil will shorten the life. Lubricate the bearings periodically.

The bearings of the pulleys on each flexible condenser drive cable should be lubricated at two points with No. 30 oil at least every four weeks.

5.4. ROUTINE CHECKS.

5.4.1. TUBE CHECK.

(a) A check on the emission of all tubes should be made at least every 1000 hours of service.

(b) Keep a record of the length of time the tube filaments and plates are in use.

(c) Operate tubes as near their rated value of voltage and current as possible.

(d) Replace tubes that have been in service a long time with new tubes.

(e) Visually inspect the elements inside of the tubes. Elements may have become warped, increasing the probability of short-circuits.

(f) When the type 872A, or type 866A, mercury vapor tubes are put into service for the first time, the filaments should be operated at normal temperature for at least 20 minutes before plate voltage is applied. See paragraph 3.1.4.

5.4.2. MECHANICAL INSPECTION. -

(a) Check all connections at least once a month. Tighten any nuts, bolts, or screws that may have become loose.

(b) Check all contacts of cable receptacles and plugs to assure clean, firm mechanical and electrical connections.

(c) Inspect and burnish interlock switches on the rear doors weekly.

(d) Examine all mechanical parts of moving assemblies, such as tuning controls, etc., for excessive wear.

5.5. TROUBLE SHOOTING.

5.5.1. TUBE FAILURE. - The most frequent cause of trouble in equipment of this type is tube failure. Check tubes by replacement. Tubes are the most likely trouble and are the simplest corrective measure which can be performed. Low emission tubes may be the cause of erratic or poor performance of the equipment. If there is any doubt concerning the emission of any tube, it should be checked immediately and replaced if defective. Tubes with electrical noises cause excessive distortion or hum. This fault may be more difficult to isolate to a particular tube; however, a tube suspected of faulty operation may be checked by replacing with a like tube known to be in good condition.

5.5.2. LOCATION OF TROUBLE. - The transmitter may fail to function either at the time of attempting to start it, or it may fail during operation. In either case, the procedure for making a test is to check the circuits in the order of succession they are made operative in the process of starting the transmitter.

This procedure should aid in isolating the trouble to one or two units. A check of both circuit breakers and all fuses in the transmitter should be made to ascertain the power circuit affected by the trouble.

The following tables of operating voltages and current measurements are supplied to assist the operator in trouble shooting. Open and short circuits will usually be accompanied by a change in the voltage applied to one or more of the tubes. A check of the various tube voltages and current measurements against the values shown in the tables will assist in locating the source of trouble.

5.5.3. SERVICING THE EQUIPMENT. - The major portion of components are mounted in the vertical chassis within the cabinets. This adds consid-

erable accessibility to all components, as access to all components is readily attained from either front or the rear of the transmitter. The lower panel in the rear of the cabinet can be removed promptly if deemed necessary to gain access to components that need servicing. One-man replacement of all components has been designed into this equipment wherever practical.

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL SHOULD AT ALL TIMES OBSERVE PROPER SAFETY PRECUATIONS. DO NOT MAKE ADJUSTMENTS INSIDE THE CABINET WHILE ANY OF THE POWER SUPPLIES ARE OPERATING. DO NOT DEPEND UPON INTERLOCK FOR PROTECTION. THE EQUIPMENT SHOULD BE COMPLETELY SHUT DOWN BEFORE THE REAR DOORS ARE OPENED.

TABLE 5-1

20V NORMAL OPERATING CHARACTERISITICS, AM BROADCAST BAND

Tube	Tube Type	Function	Normal Operating Characteristics		
V-101	6AU6	Oscillator, Pierce Circuit	Plate Voltage	270	volts
			Crystal Current	1.6	ma.
			Cathode Current	4.0	ma.
V-102	6SJ7	Buffer Amplifier	Plate Voltage	280	volts
			Screen Voltage	130	volts
			Grid Current	0.1	ma.
			Cathode Current	6.5	ma.
V-103	807	RF Driver Amplifier	Plate Voltage	550	volts
			Screen Voltage	260	volts
			Cathode Current	55	ma.
			Grid Current	1	ma.
V-104, V-105	4-400A	Power Amplifier	Output (watts)	1100 550	watts
			Plate Voltage	3100 2200	volts
			Plate Current	500 330	ma.
			Screen Voltage	470 330	volts
			Grid Current	20 20	ma.
			Plate Efficiency	73.5 75.8	%
V-106, V-107	6SJ7	1st Audio Amplifier (Triode Connected)	Plate Voltage	300	volts
			Cathode Current	2	ma./tube
V-108, V-109	6SJ7	Audio Driver Amplifier	Plate Voltage	265	volts
			Cathode Current	7	ma./tube
V-110, V-111	4-250A	Modulator	Plate Voltage	3100	volts
			Cathode Current		
			No Signal	120	ma.
			100% Mod. 1100 w	450	ma.
			100% Mod. 550 w	320	ma.
V-112	5U4G	Bias Voltage Rectifier (Values are output from filter)	Voltage	-110	volts
			Current	100	ma.
V-113, V-114	872A	High Voltage Rectifier (Values are output from filter)	Voltage	3100	volts
			Current	1	amp.
V-115, V-116	866A	Low Voltage Rectifier (Values are output from filter)	Voltage	- 550	volts
			Current	- 250	ma.

POWER INPUT TO TRANSMITTER
230 volts, single phase, 60 cycle source

	KVA	KW	PF
Filament switch ON	.78	.66	85%
550 watts output, no modulation	3.28	2.45	75%
550 watts output, 100% modulation	4.0	3.2	80%
1100 watts output, no modulation	3.7	2.95	80%
1100 watts output, 100% modulation	4.82	4.0	83%

SECTION 6

PARTS LIST

20V-1 TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
B-101	Blower Motor	BLOWER: Direct connected MOTOR: AC, 1/6 hp, 230 v, 60 cps, single phase, 1140 RPM	009 1021 00 230 0112 00
C-101	Crystal frequency trimmer for Y-101	CAPACITOR: Variable, 7.5 mmf to 102.7 mmf	922 0028 00
C-102	Crystal frequency trimmer for Y-102	CAPACITOR: Variable, 7.5 mmf to 102.7 mmf	922 0028 00
C-103	Feedback capacitor for V-101	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019 00
C-104	Cathode by-pass capacitor for V-101	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-105	Screen by-pass for V-101	CAPACITOR: Mica, 150 mmf p/m 20%, 500 WVDC	935 0114 00
C-106	Coupling capacitor V-101 to V-102	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-107		Not Used	
C-108		Not Used	
C-109	Multimeter by-pass, Buffer grid, 2.5 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-110	Plate decoupling capacitor for V-101	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-111	Cathode by-pass capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-112	Screen by-pass capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-113	Plate tank padding capacitor for V-102	CAPACITOR: Mica, 100 mmf p/m 10%, 500 WVDC (p/o T-102)	912 0495 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUM
C-114 and C-115	Plate tank trimmer capacitor for V-102	CAPACITOR: Double, Variable, 5-10 mmf min to 100-105 mmf max (p/o T-102)	922 4800
C-116	Compensating capacitor grid to cathode of V-103	CAPACITOR: Ceramic, 20 mmf p/m 5%, 500 WV	916 4420
C-117		Not Used	
C-118		Not Used	
C-119	Coupling capacitor V-102 to V-103	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105
C-120	Plate decoupling capacitor for V-102	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103
C-121	Multimeter by-pass capacitor for 807 Grid, 25 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103
C-122	Cathode by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103
C-123	Screen by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103
C-124	Plate tank padding capacitor for V-103	CAPACITOR: Mica, 100 mmf p/m 10%, 500 WVDC (p/o T-103)	912 0495
C-125 and C-126	Plate tank trimmer capacitor for V-103	CAPACITOR: Double, Variable, 5-10 mmf min to 100-105 mmf max (p/o T-103)	922 4800
C-127		Not Used	
C-128		Not Used	
C-129	Plate decoupling capacitor for V-103	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019
C-130	Decoupling capacitor for low voltage stages	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-131	Neutralizing condenser, for high frequency service only	CAPACITOR: 10 mmf p/m 10%, 17,000 WV	919 0062 00
C-132	Coupling capacitor, V-103 to V-104 and V-105	CAPACITOR: Mica, 1000 mmf p/m 20%, 3500 WVDC	914 0019 00
C-133	Meter by-pass capacitor, PA Grid, 25 ma position	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-134	Filament by-pass capacitor for V-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-135	Filament by-pass capacitor for V-105	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-136	Filament by-pass capacitor for V-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-137	Filament by-pass capacitor for V-105	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-138	Screen by-pass capacitor for V-104	CAPACITOR: 67 mmf p/m 5%, 5000 WV	913 0090 00
C-139	Screen by-pass capacitor for V-105	CAPACITOR: 67 mmf p/m 5%, 5000 WV	913 0090 00
C-140	By-pass capacitor for PA plate current meter M-102	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-141	Plate decoupling capacitor for V-104 and V-105	CAPACITOR: Ceramic, 500 mmf plus 50%, minus 20%, 20,000 WVDC	913 1101 00
C-142	Coupling capacitor V-104 and V-105 to output network	CAPACITOR: Mica, .0002 mmf p/m 5%, 5000 WVDC	906 3202 00
C-143	Screen by-pass capacitor for V-104	CAPACITOR: 67 mmf p/m 5%, 5000 WV	913 0090 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUM
C-144	Screen by-pass capacitor for V-105	CAPACITOR: 67 mmf p/m 5%, 5000 WV	913 0090
*C-145	Padder capacitor for PA plate tank, 550-590 frequency	CAPACITOR: 400 mmf	924 1021
*C-145	Padder capacitor for PA plate tank, 600-790 frequency	CAPACITOR: Same as for 550-590 KC	924 1021
*C-145	Padder capacitor for PA plate tank, 800-990 frequency	CAPACITOR: Same as for 550-590 KC	924 1021
*C-145	Padder capacitor for PA plate tank, 1000-1290 frequency	CAPACITOR: Same as for 550-590 KC	924 1021
C-146	PA Plate tuning capacitor	CAPACITOR: Variable, 60 mmf min to 188 mmf max	920 0075
C-147	PA Plate loading capacitor	CAPACITOR: Variable, 465 mmf	920 3510
*C-148	Padder capacitor, PA output network, 550-590 frequency	CAPACITOR: Mica, 800 mmf, 5000 WV	906 3801
*C-148	Padder capacitor, PA output network, 600-790 frequency	CAPACITOR: Same as for 550-590 KC	906 3801
*C-148	Padder capacitor, PA output network, 800-990 frequency	CAPACITOR: Same as for 550-590 KC	906 3801
*C-148	Padder capacitor, PA output network, 1000-1290 frequency	CAPACITOR: Same as for 550-590 KC	906 3801
*C-148	Padder capacitor, PA output network, 1300-1600 frequency	CAPACITOR: Mica, 400 mmf 5000 WV	906 3401

* NOTE: Values Depend upon Frequency of Operation.

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*C-149	Padder capacitor, PA output network, 550-590 frequency	CAPACITOR: Mica, 2000 mmf p/m 5%, 6000 TV	906 2208 10
*C-149	Padder capacitor, PA output network, 600-790 frequency	CAPACITOR: Same as for 550-590 KC	906 2208 10
*C-149	Padder capacitor, PA output network, 800-990 frequency	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10
*C-149	Padder capacitor, PA output network, 1000-1290 frequency	CAPACITOR: Same as for 800-990 KC	906 3801 10
*C-149	Padder capacitor, PA output network, 1300-1600 frequency	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
*C-150	Padder capacitor, PA output network, 550-590 frequency	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10
*C-150	Padder capacitor, PA output network, 600-790 frequency	CAPACITOR: Same as for 550-590 KC	906 3801 10
*C-150	Padder capacitor, PA output network, 800-990 frequency	CAPACITOR: Same as for 550-590 KC	906 3801 10
*C-150	Padder capacitor, PA output network, 1000-1290 frequency	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
*C-150	Padder capacitor, PA output network, 1300-1600 frequency	CAPACITOR: Same as 1000-1290 KC	906 3401 10
*C-151	Padder capacitor, PA output network, 550-590 frequency	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10

* NOTE: Values Depend upon Frequency of Operation.

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*C-151	Padder capacitor, PA output network, 600-790 frequency	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
*C-151	Padder capacitor, PA output network, 800-990 frequency	CAPACITOR: Mica, 800 mmf p/m 5%, 5000 WV	906 3801 10
*C-151	Padder capacitor, PA output network, 1000-1290 frequency	CAPACITOR: Mica, 400 mmf p/m 5%, 5000 WV	906 3401 10
C-152	Plate decoupling capacitor for V-104 and V-105	CAPACITOR: Ceramic, 500 mmf plus 50%, minus 20%, 20,000 WVDC	913 1101 00
C-153	By-pass capacitor for multimeter, M-104	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-154	Feedback insertion, V-106	CAPACITOR: Mica, 3300 mmf p/m 20%, 1200 WVDC	936 0283 00
C-155	Feedback insertion for V-107	CAPACITOR: Mica, 3300 mmf p/m 20%, 1200 WVDC	936 0283 00
C-156	Coupling capacitor, V-106 to V-108	CAPACITOR: Paper, .05 mf p/m 10%, 600 WVDC	961 5015 00
C-157	Coupling capacitor, V-107 to V-109	CAPACITOR: Paper, .05 mf p/m 10%, 600 WVDC	961 5015 00
C-158	Coupling capacitor, V-108 to V-110	CAPACITOR: Paper, 1 mf plus 40%, minus 15%, 600 WVDC	961 5116 00
C-159	Coupling capacitor, V-109 to V-111	CAPACITOR: Paper, 1 mf plus 40%, minus 15%, 600 WVDC	961 5116 00
C-160	Filament by-pass capacitor for V-110 and V-111	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10

* NOTE: Values Depend upon Frequency of Operation

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-161	Filament by-pass capacitor for V-110 and V-111	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-162	Plate decoupling capacitor for V-106 and V-107	CAPACITOR: Paper, 2 mf p/m 10%, 600 WVDC	930 0046 00
C-163	D-C blocking capacitor for T-105	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-164	By-pass capacitor PA plate voltage meter	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-165	Filament by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-166	Filament by-pass capacitor for V-103	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
C-167	Filter capacitor, bias supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00
C-168	Filter capacitor, bias supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00
C-169	Tunes L-114 in H.V. filter to ripple frequency	CAPACITOR: Paper, .15 mf p/m 10%, 5000 WVDC	930 0035 00
C-170	Filter capacitor, high voltage supply filter	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-171	By-pass capacitor for modulator plate current meter, M-105	CAPACITOR: Mica, 5100 mmf p/m 5%, 500 WVDC	935 2105 00
C-172	Filter capacitor, low voltage supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUM
C-173	Filter capacitor, low voltage supply filter	CAPACITOR: Paper, 8 mf p/m 20%, 600 WVDC	956 2014
C-174	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-175	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-176	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-177	Part of feedback network, plate of V-110 to grid of V-106	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-178	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-179	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-180	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162
C-181	Part of feedback network, plate of V-111 to grid of V-107	CAPACITOR: Mica, 47 mmf p/m 20%, 2500 WVDC	936 0162

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-182		Not Used	
C-183		Not Used	
C-184	Filter capacitor, high voltage supply filter	CAPACITOR: Paper, 4 mf p/m 20%, 4000 WVDC	930 0045 00
C-185	Coupling capacitor to frequency monitor jack, J-104	CAPACITOR: Mica, .01 mf p/m 5%, 500 WV	910 1103 10
E-100	Primary power input terminal board	BOARD: 3 terminals	306 0069 00
E-101	Terminal board connecting modulator chassis to power supplies	BOARD: 11 terminals	367 5110 00
E-102	Terminal board connecting r-f chassis to power supplies	BOARD: 11 terminals	367 5110 00
E-103	Audio input terminal board	BOARD: 3 terminals	367 4030 00
E-104	Audio monitoring output terminal board	BOARD: 2 terminals	367 4020 00
F-101	One Fourth amp fuse in primary of bias supply transformer T-106	FUSE: Cartridge, 1 amp 250 v	264 4050 00
F-102	One amp fuse in primary of high voltage rectifier filament transformer, T-107	FUSE: Cartridge, 1 amp 250 v	264 4050 00
F-103	Three amp fuse in primary of filament transformer, T-109	FUSE: Cartridge, 3 amp 250 v	264 4080 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBE
F-104	One amp fuse in primary of low voltage supply transformer	FUSE: Cartridge, 1 amp 250 v	264 4050 0(
I-101	Filaments at operating temperature indicator	BULB: Candelabra base, 230-250 v, 10 w	262 0169 0(
I-102	Lumiline meter panel lamp, illuminates meter panel	BULB: Lumiline, disc base, 220 VAC RMS, 40 w	262 0170 0(
I-103	Lumiline meter panel lamp, illuminates meter panel	BULB: Lumiline, disc base, 220 VAC RMS, 40 w	262 0170 0(
I-104	Plate ON lamp, indicates when high and low voltage is on	BULB: Candelabra base, 230-250 v, 10 w	262 0169 0(
J-100	Jack for modulation monitor	RECEPTACLE: Chassis mtg	357 9005 00
J-101	Modulator unit connector	CONNECTOR: Four prong socket for chassis mtg	364 2040 00
J-102	Modulator unit connector	CONNECTOR: Chassis mtg socket	366 2080 00
J-103	RF chassis connector	CONNECTOR: Chassis mtg socket	366 2080 00
J-104	Frequency monitor jack	RECEPTACLE: Chassis mtg	357 9005 00
J-105	Socket for F-101	HOLDER: Fuse	265 1002
J-106	Socket for F-102	HOLDER: Fuse	265 1002
J-107	Socket for F-103	HOLDER: Fuse	265 1002
J-108	Socket for F-104	HOLDER: Fuse	265 1002
K-101	Thermal time delay relay provides adequate filament warm-up period	RELAY: 3 amp 150 v DC, 3 amp 250 v AC contacts	402 0211

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
K-102	Plate relay, shunts thermal element in K-101 with resistor, shorts K-101 relay contacts, and completes circuit from S-107 to T-108 and T-110	RELAY: 25 amp 600 v contacts, 220 v coil	401 1147 00 401 1261-000
**L-101		Not Used	
L-102		COIL: (p/o T-102)	
L-102A	Part of plate tank coil for V-102	Section of L-102	
L-102B	Part of plate tank coil for V-102	Section of L-102	
**L-103		Not Used	
L-104		COIL: (p/o T-103)	
L-104A	Part of plate tank coil for V-103	Section of L-104	
L-104B	Part of plate tank coil for V-103	Section of L-104	
**L-105		Not Used	
L-106	RF choke in B plus lead to V-103	COIL: RF 300 ma	240 5800 00
L-107	RF choke in B plus lead to V-104 and V-105	COIL:	571 0460 00
*L-108	PA plate tuning coil, 550-590 frequency	INDUCTOR: RF fixed tank, 150 mh	980 0041 00
*L-108	PA plate tuning coil, 600-790 frequency	INDUCTOR: RF fixed tank, 150 mh	980 0041 00

* NOTE: Values Depend on Frequency of Operation.
** NOTE: For high Frequency broadcast only.

PARTS LIST

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
*L-108	PA plate tuning coil, 800-990 frequency	INDUCTOR: RF fixed tank, 81 mh	980 0040 00
*L-108	PA plate tuning coil, 1000-1290 frequency	INDUCTOR: RF fixed tank, 81 mh	980 0040 00
*L-108	PA plate tuning coil, 1300-1600 frequency	INDUCTOR: RF fixed tank, 81 mh	980 0040 00
L-109	PA plate loading coil	COIL:	
L-110	Static drain choke, feeds modulation monitor	COIL: 56 turns, #22 copper wire	572 0700 30
L-111	Modulation reactor	REACTOR: 7500 TV RMS	678 0400 00
L-112	Filter choke, bias voltage supply filter	REACTOR: .080 amp DC	668 0004 00
L-113	Filter choke, bias voltage supply filter	REACTOR: .080 amp DC	668 0004 00
L-114	Filter choke, high voltage supply filter	REACTOR: 9000 TV RMS 10 HY 50Ω	678 0386 00
L-115	Filter choke, high voltage supply filter	REACTOR: 9000 TV RMS Feed	678 0386 00
L-116	Filter choke, low voltage supply filter	REACTOR: 2500 TV RMS	678 0384 00
L-117	Filter choke, low voltage supply filter	REACTOR: 2500 TV RMS	678 0384 00
* NOTE:	Values Depend upon Frequency of Operation.		

PARTS LIST

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
M-101	Meters rf line current	METER: 6 RF amp	451 0082 00
M-102	Meters PA plate current	MILLIAMMETER: DC, 0-800 ma	450 0095 00
M-103	Meters PA plate voltage	METER: 0-1 ma, 0-4000 v DC (includes R-169)	458 0196 00
M-104	Multimeter	MILLIAMMETER: 0-1 ma DC	458 0170 00
M-105	Meters modulator plate current	MILLIAMMETER: 0-800 ma DC	450 0095 00
P-100	Plug for modulation monitor	CONNECTOR: RF concentric cable	357 9014 00
P-101	Connects from J-102 to M-104 and M-105	CONNECTOR: Cable connector with cover	363 8042 00
P-102	Connects from J-103 to J-104	CONNECTOR: Cable connector with cover	365 8080 00
P-103	Connects from J-104 to J-103	CONNECTOR: Cable connector with cover	365 8080 00
P-104	Plug for frequency monitor	CONNECTOR: RF concentric cable	357 9014 00
R-101	Grid resistor for V-101	RESISTOR: .1 megohm p/m 10%, 1/2 w	745 1170 00
R-102	Cathode resistor for V-101	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-103	Plate load resistor, for V-101	RESISTOR: 10,000 ohm p/m 10%, 1 w (p/o T-101)	745 3128 00
R-104	Screen voltage dropping resistor for V-101	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-105	Voltage dropping resistor, V-101	RESISTOR: .12 megohm p/m 10%, 2 w	745 5174 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-106	Voltage dropping resistor, V-101	RESISTOR: .12 megohm p/m 10%, 2 w	745 5174 00
R-107	Grid resistor, V-102	RESISTOR: .1 megohm p/m 10%, 1/2 w	745 1170 00
R-108	Multimeter shunt resistor, 1st Buffer Grid, 2.5 ma position	RESISTOR: 3900 ohm p/m 10%, 1/2 w	745 1111 00
R-109	Voltage divided feeds frequency monitor	RESISTOR: 56,000 ohm p/m 10%, 2 w	745 5034 00
R-110	Cathode resistor for V-102	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-111	Voltage dividing resistor for V-102	RESISTOR: 39,000 ohm p/m 10%, 1 w	745 3153 00
R-112	Screen voltage dropping resistor, V-102	RESISTOR: 33,000 ohm p/m 10%, 1 w	745 3149 00
R-113	Voltage dropping resistor, V-102	RESISTOR: 25 ohm p/m 10%, 10 w	710 1254 20
R-114	Grid resistor, V-103	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R-115	Cathode resistor, V-103	RESISTOR: 22 ohm p/m 10%, 2 w	745 5016 00
R-116	Stabilizing resistor, V-103	RESISTOR: 47 ohm p/m 10%, 1/2 w	745 1030 00
R-117	Screen voltage dividing resistor, V-103	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-118		Not Used	
R-119	Grid resistor, V-104 and V-105	RESISTOR: 15 ohm p/m 20%, 25 w	710 3154 [illegible]

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-120	Audio hum control B	RESISTOR: 50 ohm p/m 10%, 25 w	504 9561 002
R-121	Audio voltage source for audio monitor	RESISTOR: 12.6 ohm p/m 20%, 20 w	710 0044 00
R-122	Screen dropping resistor, V-104 and V-105	RESISTOR: 2000 ohm p/m 5%, 25 w	710 3241 00
R-123	Voltage dividing resistor for bias supply	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R-124	Part of 807 Grid resistance	RESISTOR: 4700 ohm p/m 10%, 1 w	745 3114 00
R-125	Shunt resistor for Multimeter, 807 Grid, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-126	Shunt resistor for Multimeter, PA Grid, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-127	Multimeter series resistor	RESISTOR: 5100 ohm p/m 5%, 1/2 w	745 1116 00
R-128	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-129	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-130	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-131	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-120	Audio hum control B	RESISTOR: 50 ohm p/m 10%, 25 w	504 9561 002
R-121	Audio voltage source for audio monitor	RESISTOR: 12.6 ohm p/m 20%, 20 w	710 0044 00
R-122	Screen dropping resistor, V-104 and V-105	RESISTOR: 2000 ohm p/m 5%, 25 w	710 3241 00
R-123	Voltage dividing resistor for bias supply	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R-124	Part of 807 Grid resistance	RESISTOR: 4700 ohm p/m 10%, 1 w	745 3114 00
R-125	Shunt resistor for Multimeter, 807 Grid, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-126	Shunt resistor for Multimeter, PA Grid, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-127	Multimeter series resistor	RESISTOR: 5100 ohm p/m 5%, 1/2 w	745 1116 00
R-128	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-129	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-130	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00
R-131	Part of T-pad for audio input to T-104	RESISTOR: 150 ohm p/m 10%, 1/2 w	745 1051 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-132	Part of T-pad for audio input to T-104	RESISTOR: 430 ohm p/m 5%, 1/2 w	745 1070 00
R-133	Grid resistor for V-106	RESISTOR: 68,000 ohm p/m 10%, 1/2 w	745 1163 00
R-134	Grid resistor for V-107	RESISTOR: 68,000 ohm p/m 10%, 1/2 w	745 1163 00
R-135	Voltage divider for feedback network to V-106	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-136	Voltage divider for feedback network to V-107	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-137	Cathode resistor, V-106 and V-107	RESISTOR: 5600 ohm p/m 10%, 1/2 w	745 1118 00
R-138	Multimeter shunt resistor, Audio Cathode.	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-139	Voltage dropping resistor, V-106 and V-107	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-140	Plate load resistor, V-106	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-141	Plate load resistor, V-107	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-142	Grid resistor, V-108	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-143	Grid resistor, V-109	RESISTOR: 82,000 ohm p/m 10%, 1/2 w	745 1167 00
R-144	Cathode resistor, V-108	RESISTOR: 820 ohm p/m 10%, 1/2 w	745 1083 00
R-145	Cathode resistor, V-109	RESISTOR: 820 ohm p/m 10%, 1/2 w	745 1083 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-146	Cathode resistor and audio balance control, V-108 and V-109	RESISTOR: 400 ohm p/m 10%, 4 w	377 0006 00
R-147	Multimeter shunt resistor, 2nd Audio Cathode, 25 ma position	RESISTOR: 220 ohm p/m 10%, 1/2 w	745 1058 00
R-148	Voltage dropping resistor, V-108 and V-109	RESISTOR: 4,700 ohm p/m 10%, 2 w	745 5114 00
R-149	Plate load resistor, V-108 and V-109	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-150	Plate load resistor, V-108 and V-109	RESISTOR: 22,000 ohm p/m 10%, 2 w	745 5142 00
R-151	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-152	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-153	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-154	Part of feedback network, from plate of V-110 to grid of V-106	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-155	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-156	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-157	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-158	Part of feedback network, from plate of V-111 to grid of V-107	RESISTOR: 1 megohm p/m 10%, 2 w	745 5212 00
R-159	Part of grid resistance of V-110 and V-111	RESISTOR: 47,000 ohm p/m 10%, 2 w	745 5156 00
R-160	Part of grid resistance of V-110 and V-111	RESISTOR: 82,000 ohm p/m 10%, 1 w	745 3167 00
R-161	Part of grid resistance of V-110 and V-111	RESISTOR: 82,000 ohm p/m 10%, 1 w	745 3167 00
R-162	Modulator bias adjustment	RESISTOR: 25,000 ohm p/m 10%, 4 w	377 0011 00
R-163	Modulator bias adjustment	RESISTOR: 25,000 ohm p/m 10%, 4 w	377 0011 00
R-164	Stabilizing resistor, V-110	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R-165	Stabilizing resistor, V-111	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R-166	Voltage dropping resistor for Power Change Switch	RESISTOR: 5000 ohm p/m 10%, 160 w	710 6542 00
R-167	Voltage dropping resistor for Power Change switch	RESISTOR: 5000 ohm p/m 10%, 160 w	710 6542 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-168	DC Plate Voltmeter, M-103, shunt resistor	RESISTOR: 10,000 ohm p/m 10%, 2 w	745 5128 00
R-169	Series resistor for DC Plate Voltmeter	RESISTOR: 4 megohm (p/o M-103)	
R-170		Not Used	
R-171	Varies length of filament time delay	RESISTOR: 2000 ohm p/m 10%, 4 w	377 0008 00
R-172	Voltage dropping resistor for K-101	RESISTOR: 5000 ohm p/m 10%, 10 w	710 1542 00
R-173	Voltage dropping resistor for K-101	RESISTOR: 2500 ohm p/m 10%, 10 w	710 0030 00
R-174	Bleeder resistor for bias supply	RESISTOR: 2000 ohm p/m 10%, 25 w	710 3242 00
R-175	Part of bleeder resistance for high voltage supply	RESISTOR: 20,000 ohm p/m 5%, 100 w	710 2134 00
R-176	Part of bleeder resistance for high voltage supply	RESISTOR: 20,000 ohm p/m 5%, 100 w	710 2134 00
R-177	Part of bleeder resistance for high voltage supply	RESISTOR: 40,000 ohm p/m 10%, 100 w	710 5404 20
R-178	Bleeder resistor for low voltage supply	RESISTOR: 7500 ohm p/m 10%, 50 w	710 0099 00
R-179		Not Used	
R-180	Screen voltage dropping resistor, V-103	RESISTOR: 56,000 ohm p/m 10%, 2 w	745 5160 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-181	Screen voltage dropping resistor, V-103	RESISTOR: 56,000 ohm p/m 10%, 2 w	745 5160 00
R-182	Audio hum control A	RESISTOR: 25,000 ohm	377 0011 00
S-101	Selects desired crystal, Crystal Selector switch	SWITCH: Rotary, 2 pole, 2 position	259 0362 00
S-102	Multimeter switch, selects circuit to be metered	SWITCH: Rotary, 2 pole, 8 position	259 0441 00
S-102A		(p/o S-102)	
S-102B		(p/o S-102)	
S-103	Power change switch, shorts out dropping resistors R-166 and R-167	SWITCH: High voltage rotary, SPST, special	
S-104	Mechanical door interlock, discharges high voltage filter capacitors	SHORTING BAR: Gravity operated	
S-105	Mechanical door interlock, discharges high voltage filter capacitors	SHORTING BAR: Gravity operated	
S-106	Filament ON-OFF switch and breaker, applies voltage to filaments, blower and bias supply	CIRCUIT BREAKER: Magnetic, 230 v AC/250 v DC	260 0238 00
S-107	Plate ON-OFF switch and breaker, applies to T-108 and T-110	CIRCUIT BREAKER: Magnetic, 230 v AC/250 v DC Heinemann Cat. No. 2263-5 Replace w/ 2163 w/trip defeated. 3-31-66	260 0265 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
S-108	Electrical door interlock, removes the high and low voltage	CONTACT ASSEM: Male section of door interlock switch CONTACT ASSEM: Female section of door interlock switch	260 4040 00 260 4050 00
S-109	Electrical door interlock, removes the high and low voltage	CONTACT ASSEM: Male section of door interlock switch CONTACT ASSEM: Female section of door interlock switch	260 4040 00 260 4050 00
S-110	Blower interlock, removes high and low voltage if not closed	SWITCH: Micro, SPDT, 5 amp 250 v AC	260 0700 00
T-101	Plate tank rf can, V-101	OSCILLATOR PLATE TUNING ASSEM: (incl R-103)	504 9594 002
T-102	Plate tank rf can, V-102	INTERMEDIATE PLATE TUNING ASSEM: (incl C-113, C-114, C-115, L-102A, L-102B)	504 9632 003
T-103	Plate tank r f can, V-103	INTERMEDIATE PLATE TUNING ASSEM: (incl C-124, C-125, C-126, L-104A, L-104B)	504 9632 003
T-104	Audio input transformer feeds V-106 and V-107	TRANSFORMER: HF input audio, Pri: 600 ohm CT, Sec: 50,000 ohm CT	677 0114 00
T-105	Modulation transformer	TRANSFORMER: Modulation, Pri: 8200 ohm CT, Sec: 3840 ohm	677 0128 00
T-106	Bias supply transformer	TRANSFORMER: Power, Pri: 230 v, Sec #1: 360, 320, 280, 240 v CT, Sec #2: 5 v	672 0392 00
T-107	Filament transformer for high voltage rectifier tubes	TRANSFORMER: Filament, Pri: 230, 208 v, Sec: 5 v CT	672 0382 00
T-108	High voltage transformer	TRANSFORMER: Plate, Pri: 220, 230, 240, 250, 198, 208, 217, 226, Sec: 3200 v CT	672 0385 00
T-109	Filament transformer 866A rectifier tubes and all RF and audio tubes	TRANSFORMER: Filament, Pri: 230, 208 v, Sec #1: 5.3 v CT, Sec #2: 5.3 v CT, Sec #3: 6.3 v CT, Sec #4: 2.5 CT	672 0381 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
T-110	Low voltage supply transformer	TRANSFORMER: Plate, Pri: 230, 208 v, Sec: 550 v DC	672 0383 00
V-101	Oscillator	TUBE: Pentode 6AU6	255 0202 00
V-102	Buffer Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-103	RF Driver	TUBE: Beam 807	256 0033 00
V-104	Power Amplifier	TUBE: Tetrode 4-400A	256 0091 00
V-105	Power Amplifier	TUBE: Tetrode 4-400A	256 0091 00
V-106	1st Audio Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-107	1st Audio Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-108	Audio Driver Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-109	Audio Driver Amplifier	TUBE: Pentode 6SJ7	255 0030 00
V-110	Modulator	TUBE: Tetrode 4-250A	256 0089 00
V-111	Modulator	TUBE: Tetrode 4-250A	256 0089 00
V-112	Bias supply rectifier	TUBE: Rectifier 5U4G	255 0032 00
V-113	High voltage supply rectifier	TUBE: Rectifier 872A	256 0037 00
V-114	High voltage supply rectifier	TUBE: Rectifier 872A	256 0037 00
V-115	Low voltage supply rectifier	TUBE: Rectifier 866A	256 0049 00
V-116	Low voltage supply rectifier	TUBE: Rectifier 866A	256 0049 00
X-100	Socket for I-101	MTG: Pilot light, for candelabra base bulbs	262 0033 00
		DISC: Green	262 2370 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
X-101	Socket for I-104	MTG: Pilot light, for candelabra base bulbs	262 0033 00
		DISC: Red	262 2360 00
X-102	Socket for I-102	MTG: Pilot light, for lumiline lamp bulb	262 0177 00
X-103	Socket for I-102	MTG: Pilot light, for lumiline lamp bulb	262 0177 00
X-104	Socket for I-103	MTG: Pilot light, for lumiline lamp bulb	262 0177 00
X-105	Socket for I-103	MTG: Pilot light, for lumiline lamp bulb	262 0177 00
X-106		Adapter, for lumiline bulb	262 0175 00
X-107		Adapter, for lumiline bulb	262 0175 00
X-108		Adapter, for lumiline bulb	262 0175 00
X-109		Adapter, for lumiline bulb	262 0175 00
X-110	Socket for V-104	SOCKET: Tube, 5 prong	220 1016 00
X-111	Socket for V-105	SOCKET: Tube, 5 prong	220 1016 00
X-112	Socket for T-101	SOCKET: Tube, chassis mtg, 7 prong	220 1790 00
X-113	Socket for V-103	SOCKET: Tube, 5 contacts	220 5520 00
X-114	Socket for T-102	SOCKET: Tube, chassis mtg, 7 prong	220 1790 00
X-115	Socket for V-102	SOCKET: Tube, octal, 8 prong	220 1005 00
X-116	Socket for T-103	SOCKET: Tube, chassis mtg, 7 prong	220 1790 00
X-117	Socket for V-101	SOCKET: Tube, miniature, 7 pins	220 1034 00
X-118	Socket for Y-101	SOCKET: Tube, octal, 8 prong	220 1005 00
X-119	Socket for Y-102	SOCKET: Tube, octal, 8 prong	220 1005 00
X-120	Socket for V-110	SOCKET: Tube, 5 prong	220 1016 00

20V TRANSMITTER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
X-121	Socket for V-111	SOCKET: Tube, 5 prong	220 1016 00
X-122	Socket for V-106	SOCKET: Tube, octal, 8 prong	220 1005 00
X-123	Socket for V-107	SOCKET: Tube, octal, 8 prong	220 1005 00
X-124	Socket for V-108	SOCKET: Tube, octal, 8 prong	220 1005 00
X-125	Socket for V-109	SOCKET: Tube, octal, 8 prong	220 1005 00
X-126	Socket for K-101	SOCKET: Tube, octal, 8 prong	220 1005 00
X-127	Socket for V-112	SOCKET: Tube, octal, 8 prong	220 1005 00
X-128	Socket for V-115	SOCKET: Tube, 4 prong	220 5410 00
X-129	Socket for V-116	SOCKET: Tube, 4 prong	220 5410 00
X-130	Socket for V-113	SOCKET: Tube, 4 prong	220 5420 00
X-131	Socket for V-114	SOCKET: Tube, 4 prong	220 5420 00
Y-101	Quartz crystal	CRYSTAL:	
Y-102	Quartz crystal	CRYSTAL:	

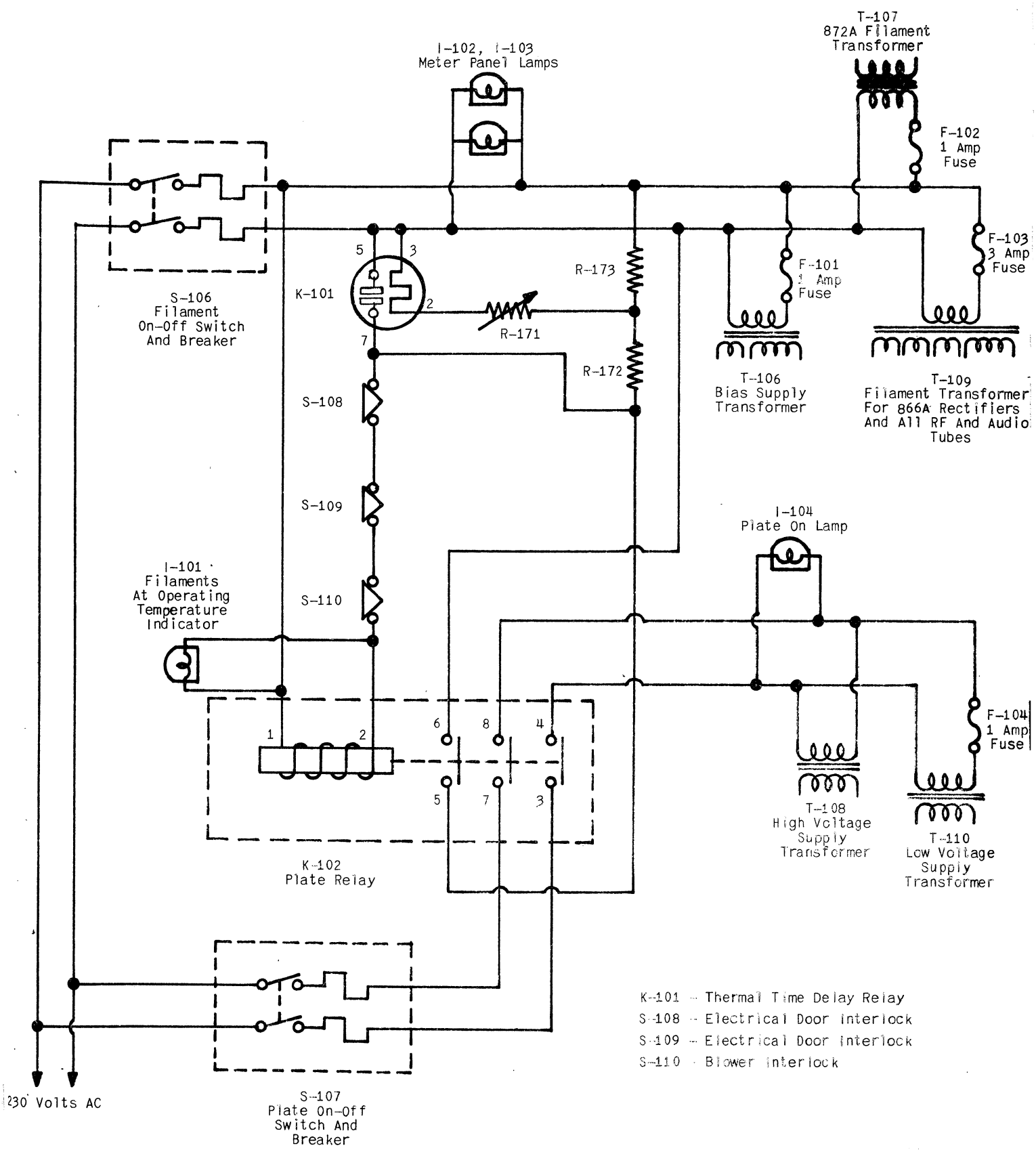


Figure 7-2 20V Primary Control Circuit Diagram

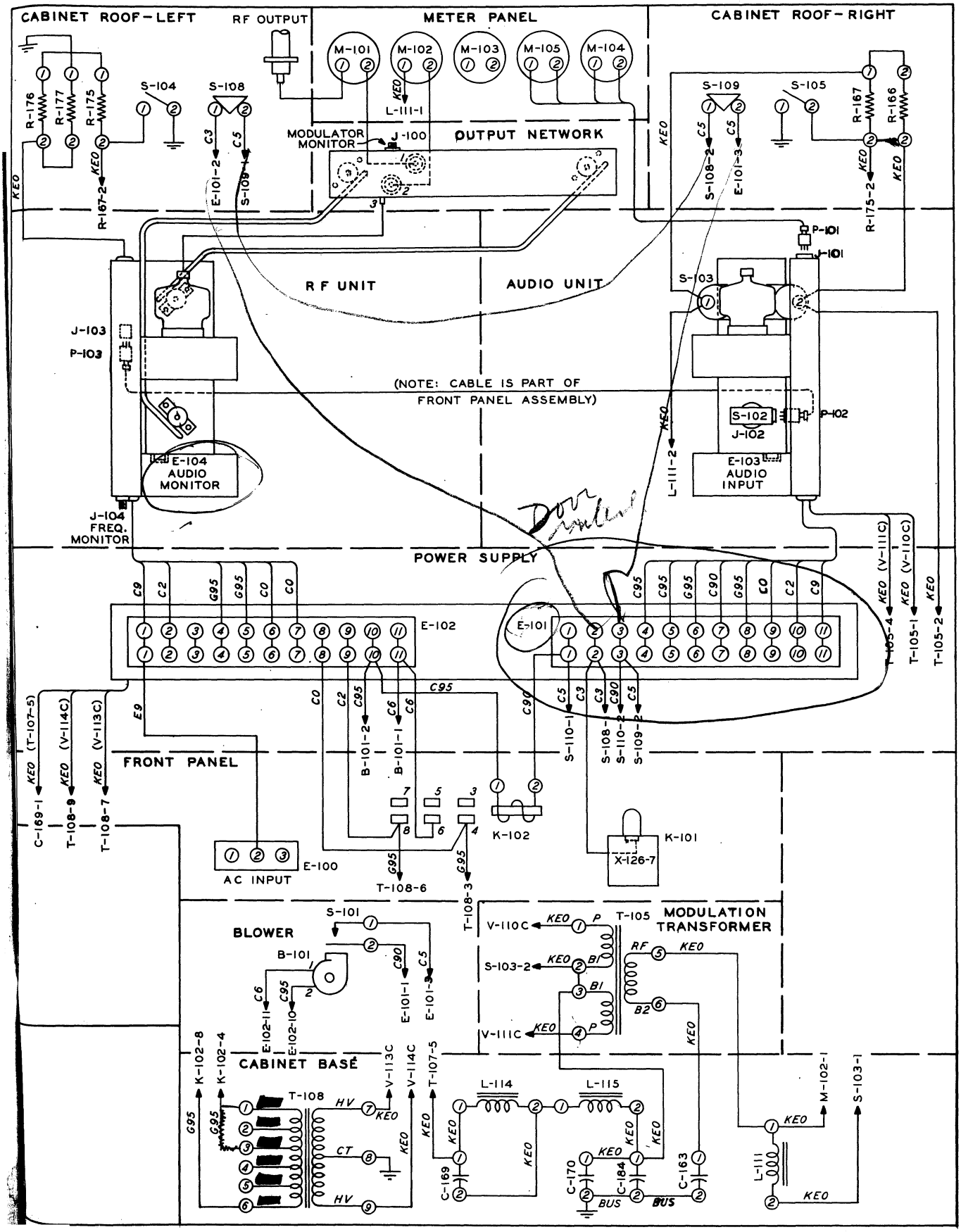


Figure 7-3. 20V Channel Wiring Diagram

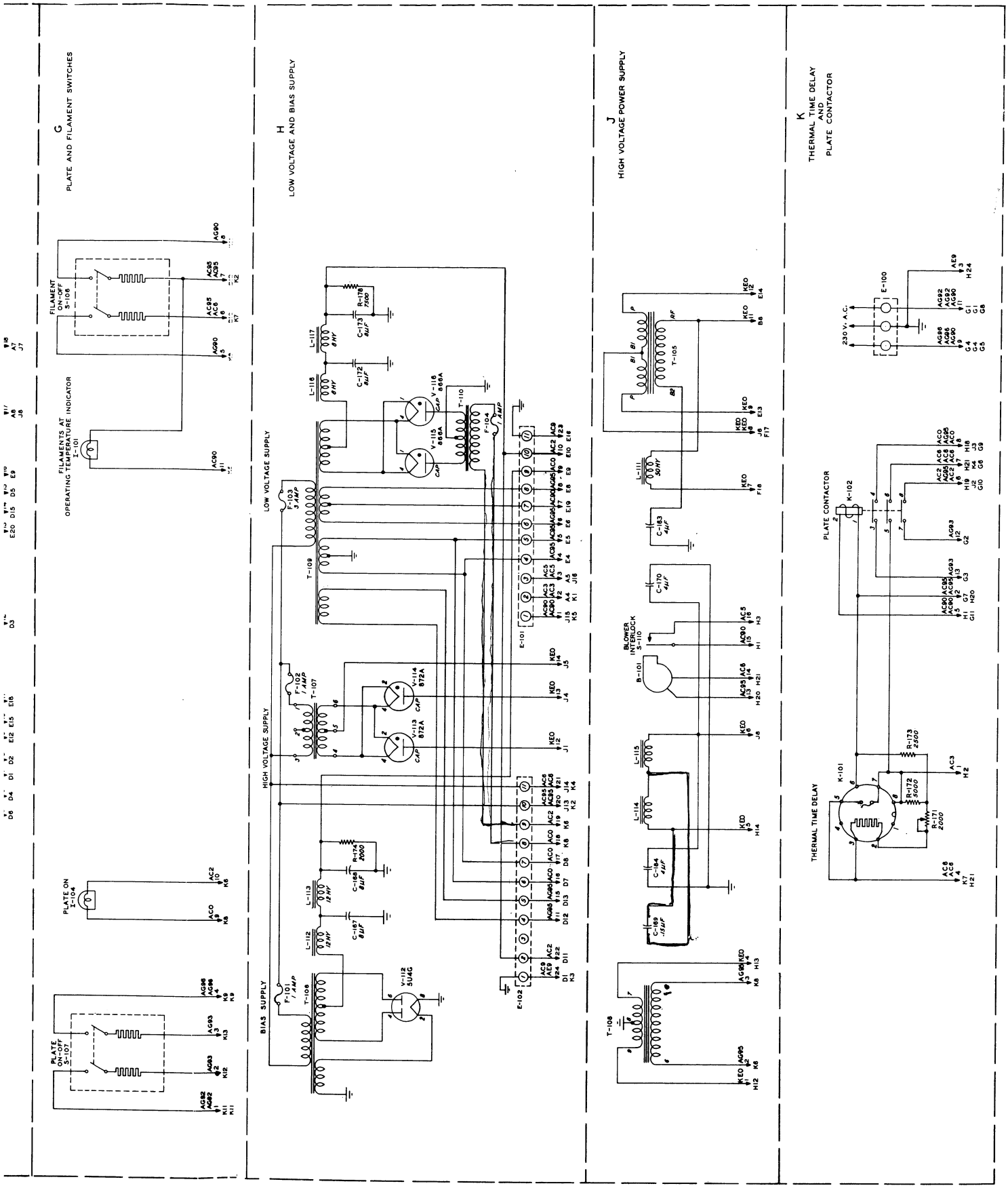
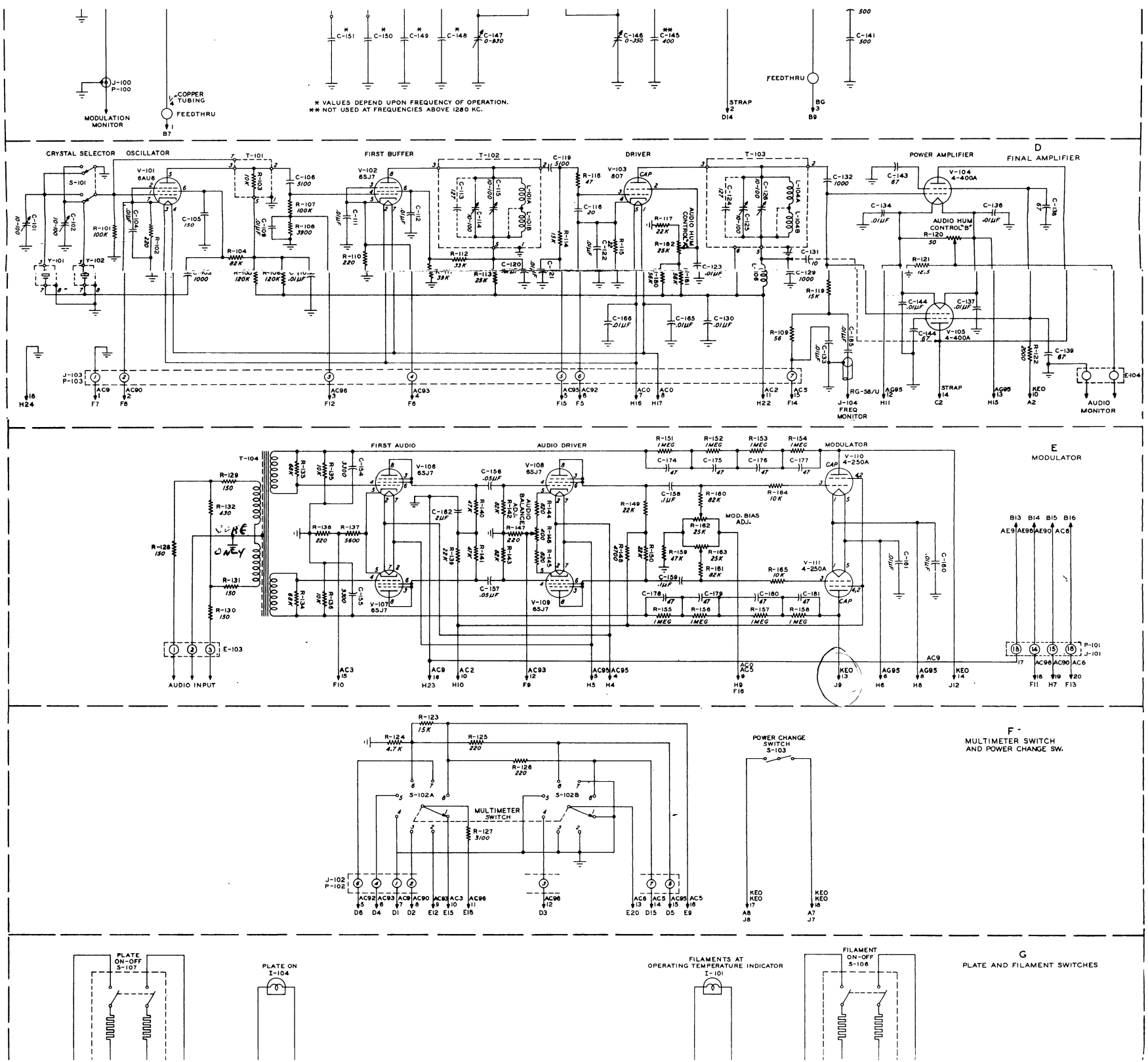
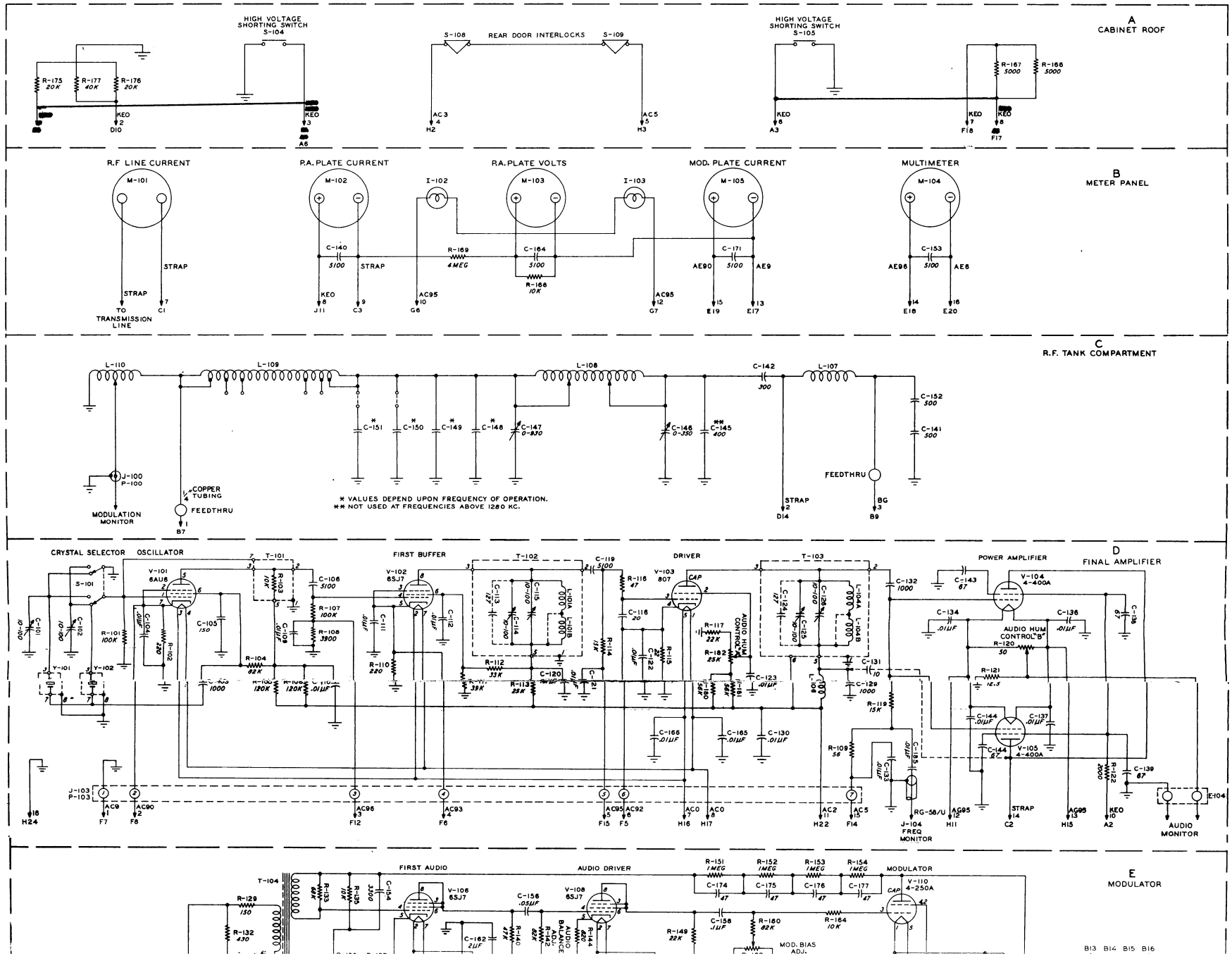


Figure 7-4. 20V Inter-Unit Cabling Diagram


J-100
P-100
MODULATION MONITOR
COPPER TUBING
FEEDTHRU
B7
C-151
C-150
C-149
C-148
C-147
0-930
C-146
0-330
C-145
400
* VALUES DEPEND UPON FREQUENCY OF OPERATION.
** NOT USED AT FREQUENCIES ABOVE 1280 KC.
STRAP
D14
FEEDTHRU
BG
B9
500
C-141
500
CRYSTAL SELECTOR
OSCILLATOR
FIRST BUFFER
DRIVER
POWER AMPLIFIER
FINAL AMPLIFIER
D
S-101
V-101
6AU6
T-101
V-102
6SJ7
T-102
V-103
807
T-103
V-104
4-400A
V-105
4-400A
Y-101
Y-102
AUDIO HUM CONTROL
AUDIO HUM CONTROL "B"
J-103
P-103
H24
F7
F8
F12
F6
F15
F5
H16
H17
H22
F14
J-104
FREQ MONITOR
RG-58/U
H11
C2
H15
A2
AUDIO MONITOR
E104
FIRST AUDIO
AUDIO DRIVER
MODULATOR
E
MODULATOR
T-104
V-106
6SJ7
V-107
6SJ7
V-108
6SJ7
V-109
6SJ7
V-110
4-250A
V-111
4-250A
MOD. BIAS ADJ.
AUDIO BALANCE ADJ.
AUDIO INPUT
E-103
F10
H23
H10
F9
H5
H4
H9
F16
J9
H6
H8
J12
P-101
J-101
F11
H7
F13
F
MULTIMETER SWITCH AND POWER CHANGE SW.
POWER CHANGE SWITCH S-103
S-102A
S-102B
MULTIMETER SWITCH
R-127
3100
J-102
P-102
D6
D4
D1
D2
E12
E15
E18
D3
E20
D15
D5
E9
A8
J8
A7
J7
G
PLATE AND FILAMENT SWITCHES
PLATE ON-OFF S-107
PLATE ON I-104
FILAMENTS AT OPERATING TEMPERATURE INDICATOR I-101
FILAMENT ON-OFF S-106


A
CABINET ROOF
HIGH VOLTAGE SHORTING SWITCH S-104
S-108
REAR DOOR INTERLOCKS
S-109
HIGH VOLTAGE SHORTING SWITCH S-105
R-175 20K
R-177 40K
R-176 20K
R-167 3000
R-168 3000
KEO 2 D10
KEO 3 A6
AC3 4 H2
AC5 5 H3
KEO 6 A3
KEO 7 F18
KEO 8 F17
B
METER PANEL
R.F LINE CURRENT
M-101
P.A. PLATE CURRENT
M-102
I-102
P.A. PLATE VOLTS
M-103
I-103
MOD. PLATE CURRENT
M-105
MULTIMETER
M-104
STRAP
STRAP
TO TRANSMISSION LINE
7 C1
C-140 5100
STRAP
KEO 8 J11
9 C3
R-169 4 MEG
C-164 5100
R-166 10K
AC95 10 G6
AC95 12 G7
C-171 5100
AE90
AE9
15 E19
13 E17
C-153 5100
AE96
AE6
14 E18
16 E20
C
R.F. TANK COMPARTMENT
L-110
L-109
L-108
L-107
C-142 300
C-152 500
C-141 300
C-151
C-150
C-149
C-148
C-147 0-930
C-146 0-330
C-145 400
J-100 P-100
MODULATION MONITOR
1/4" COPPER TUBING
FEEDTHRU 1 B7
* VALUES DEPEND UPON FREQUENCY OF OPERATION.
** NOT USED AT FREQUENCIES ABOVE 1280 KC.
FEEDTHRU
STRAP 2 D14
BG 3 B9
D
FINAL AMPLIFIER
CRYSTAL SELECTOR
OSCILLATOR
V-101 6AU8
T-101
S-101
Y-101
Y-102
FIRST BUFFER
V-102 6SJ7
T-102
DRIVER
V-103 807
T-103
POWER AMPLIFIER
V-104 4-400A
V-105 4-400A
AUDIO HUM CONTROL "B"
R-120 50
J-103 P-103
16 H24
AC9 1 F7
AC90 2 F8
AC96 3 F12
AC93 4 F6
AC95 5 F15
AC92 6 F5
AC0 7 H16
AC0 8 H17
AC2 11 H22
AC5 15 F14
J-104 FREQ MONITOR
RG-58/U
AC95 12 H11
STRAP 14 C2
AC95 13 H15
KEO 10 A2
AUDIO MONITOR
E-104
E
MODULATOR
T-104
FIRST AUDIO
V-106 6SJ7
AUDIO DRIVER
V-108 6SJ7
MODULATOR
V-110 4-250A
MOD. BIAS ADJ.
B13 B14 B15 B16

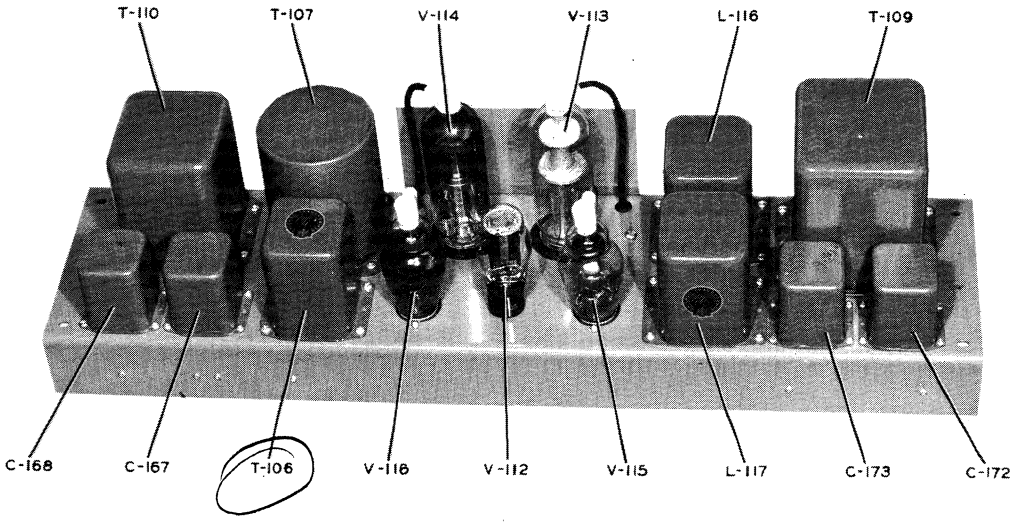


FIGURE 7-5 LOW VOLTAGE POWER SHELF PARTS ARRANGEMENT, TOP VIEW

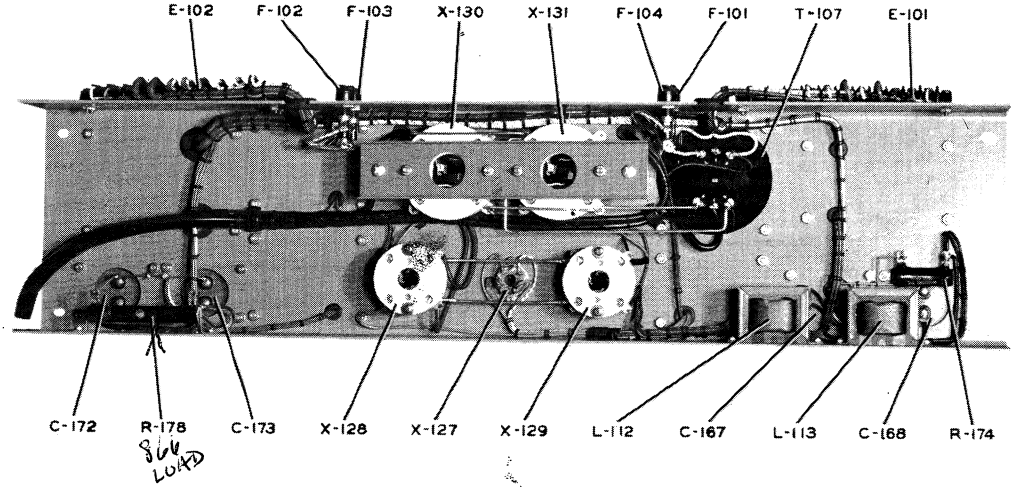


FIGURE 7-6 LOW VOLTAGE POWER SHELF PARTS ARRANGEMENT, BOTTOM VIEW

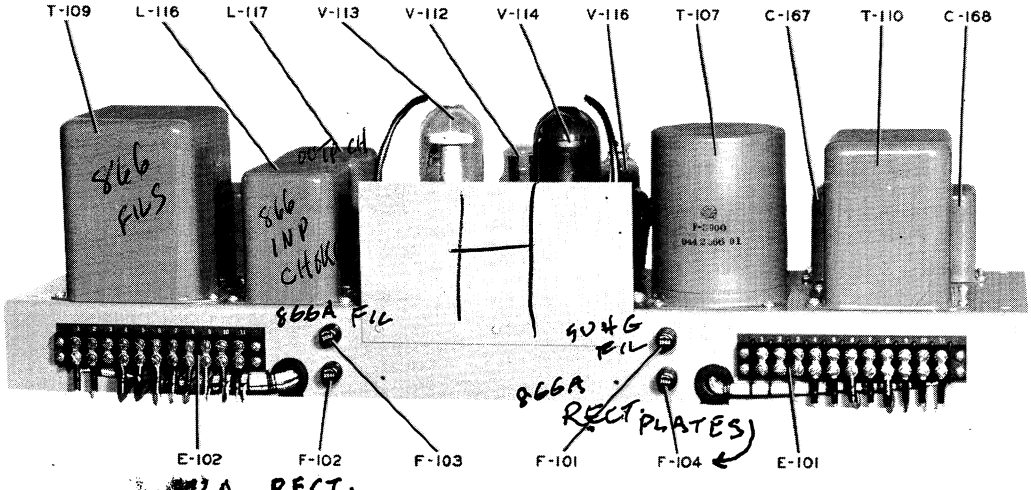


FIGURE 7-7 LOW VOLTAGE POWER SHELF PARTS ARRANGEMENT, REAR VIEW

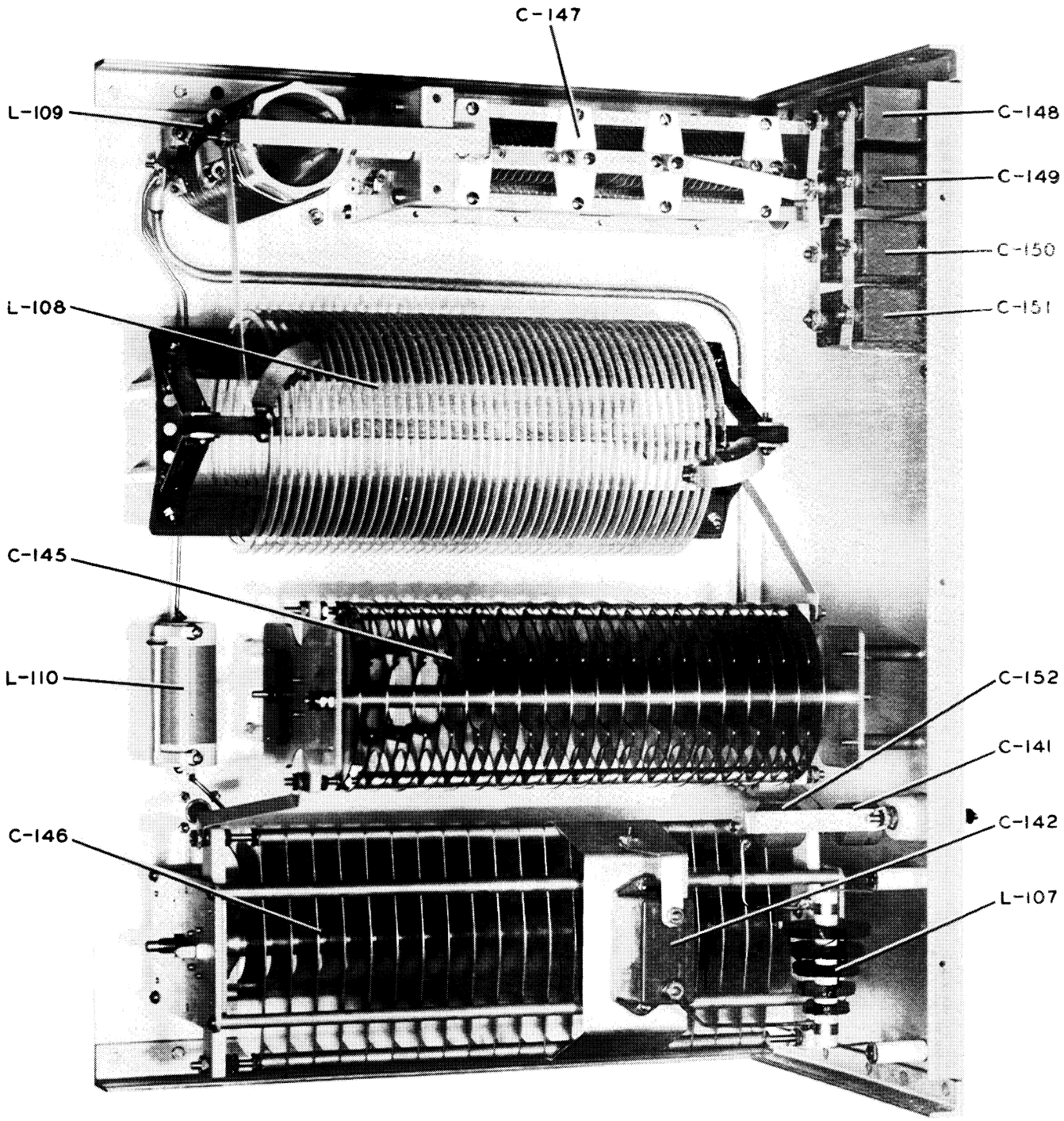


FIGURE 7-8 OUTPUT NETWORK PARTS ARRANGEMENT, BOTTOM VIEW

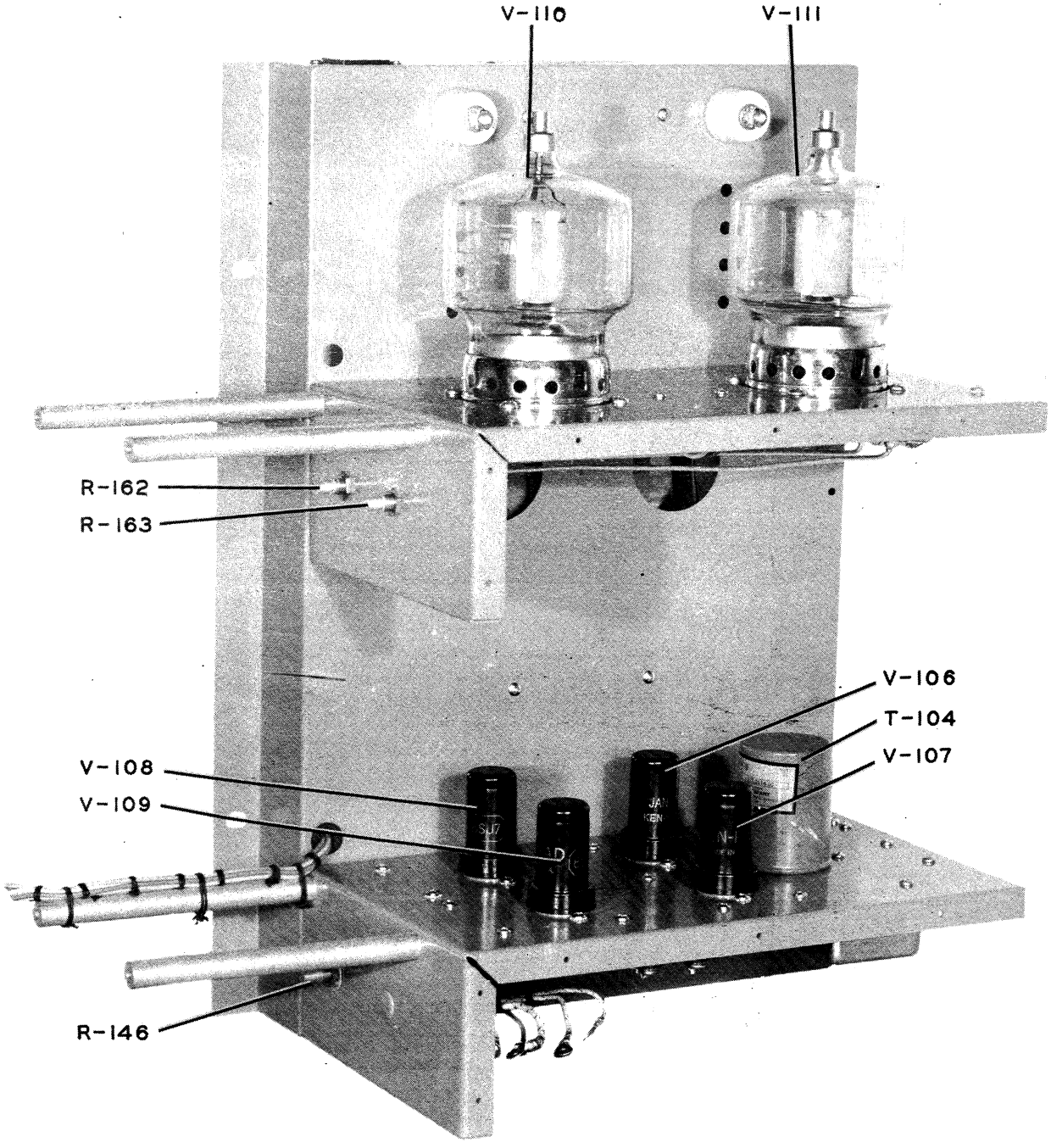
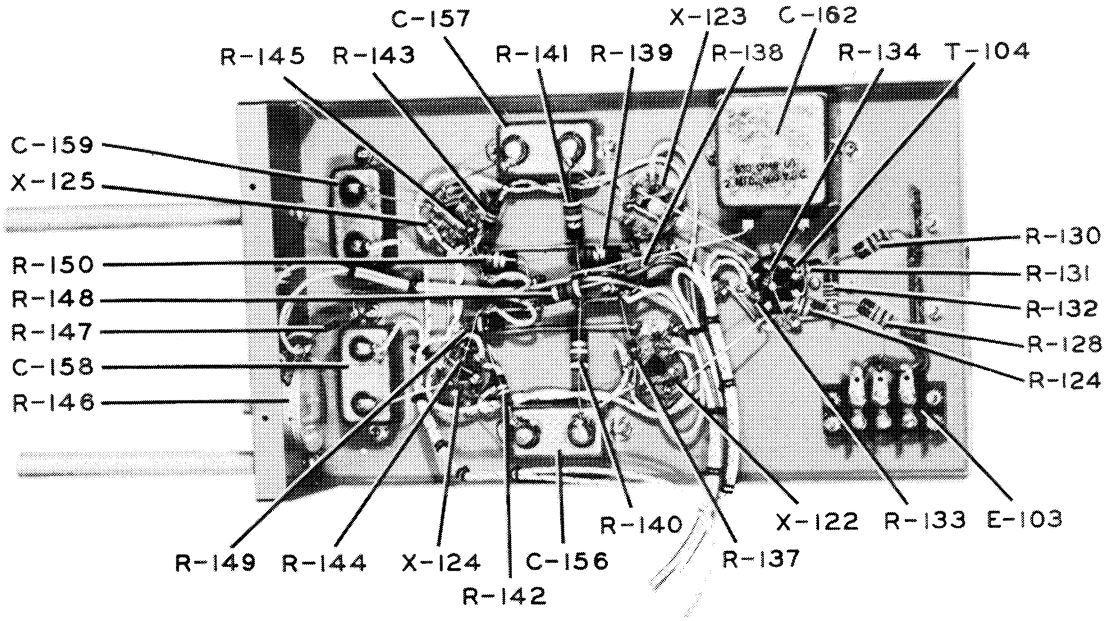


FIGURE 7-9 AUDIO CHASSIS PARTS ARRANGEMENT, TOP VIEW



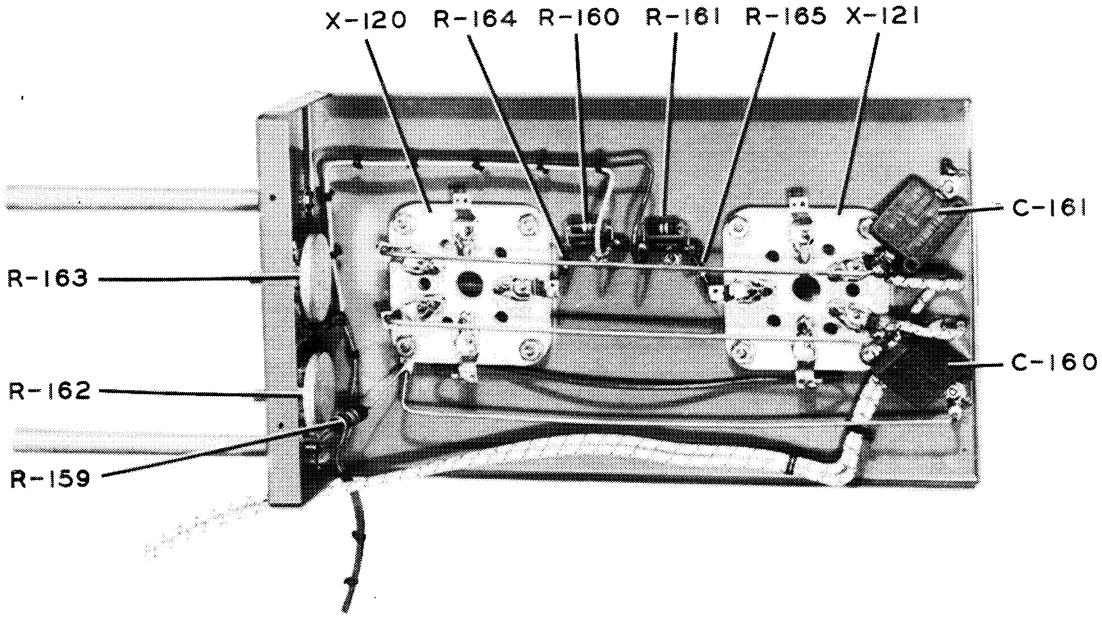


FIGURE 7-10 AUDIO CHASSIS PARTS ARRANGEMENT, BOTTOM VIEW

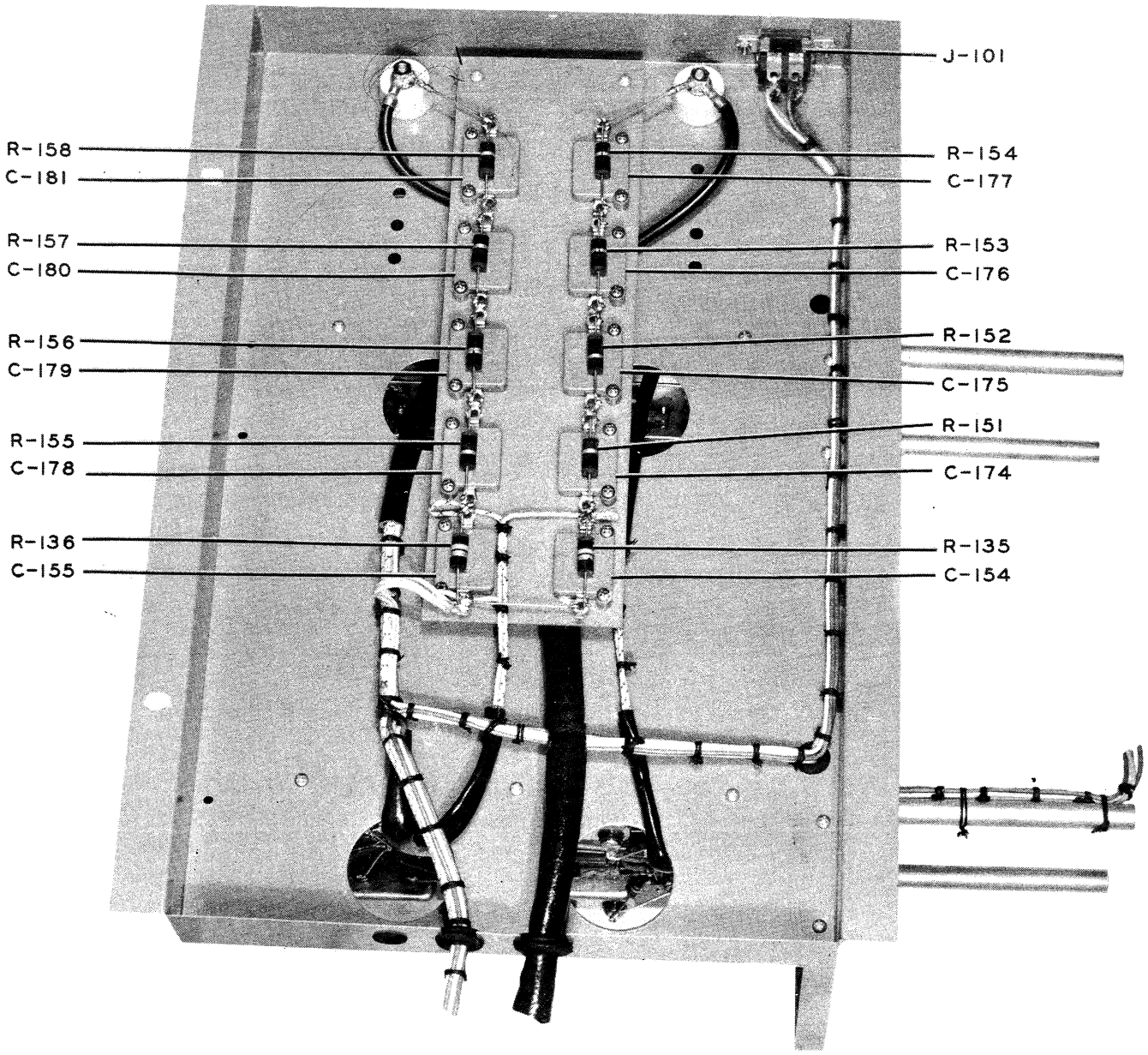


FIGURE 7-11 AUDIO CHASSIS PARTS ARRANGEMENT, SIDE VIEW

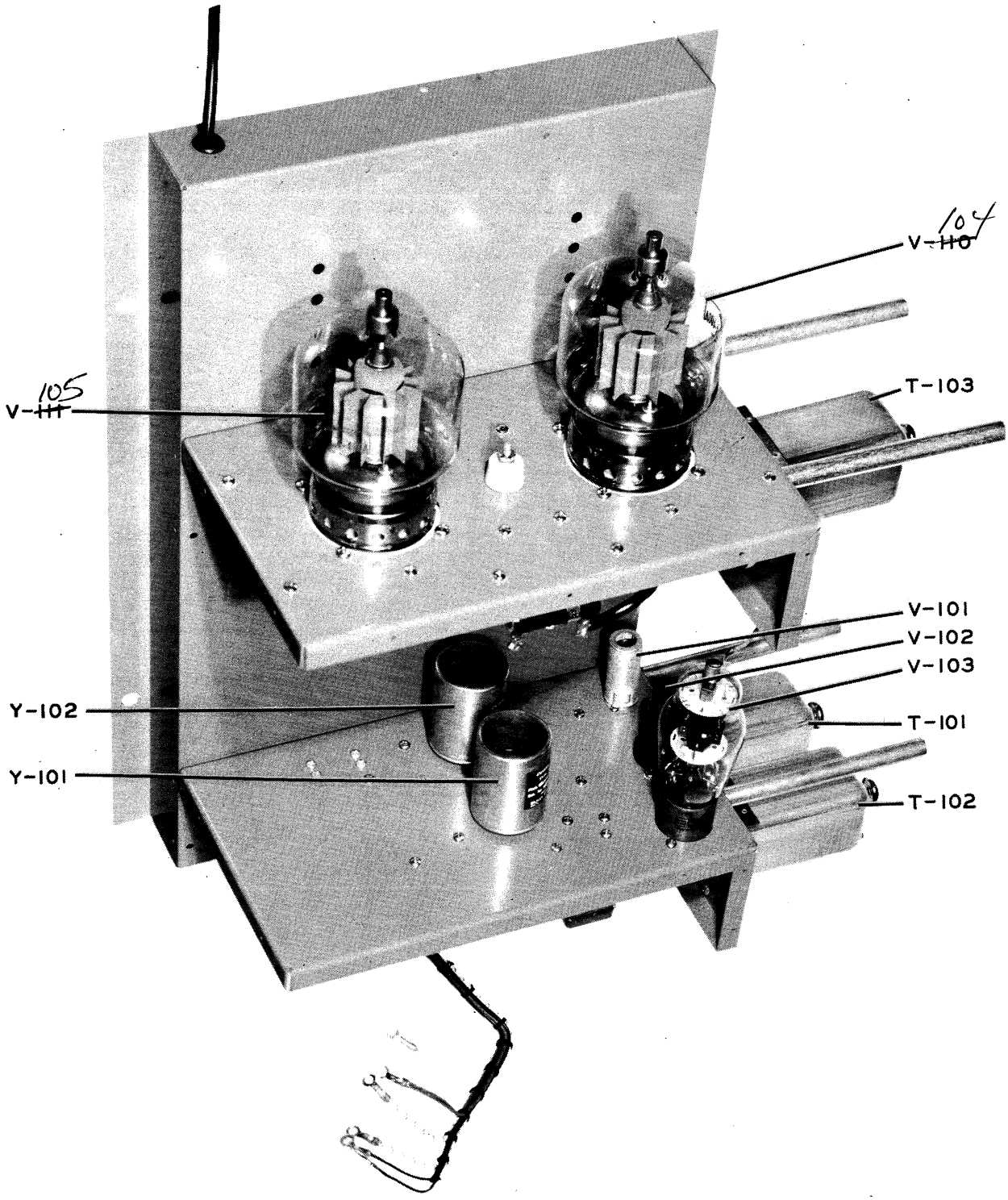
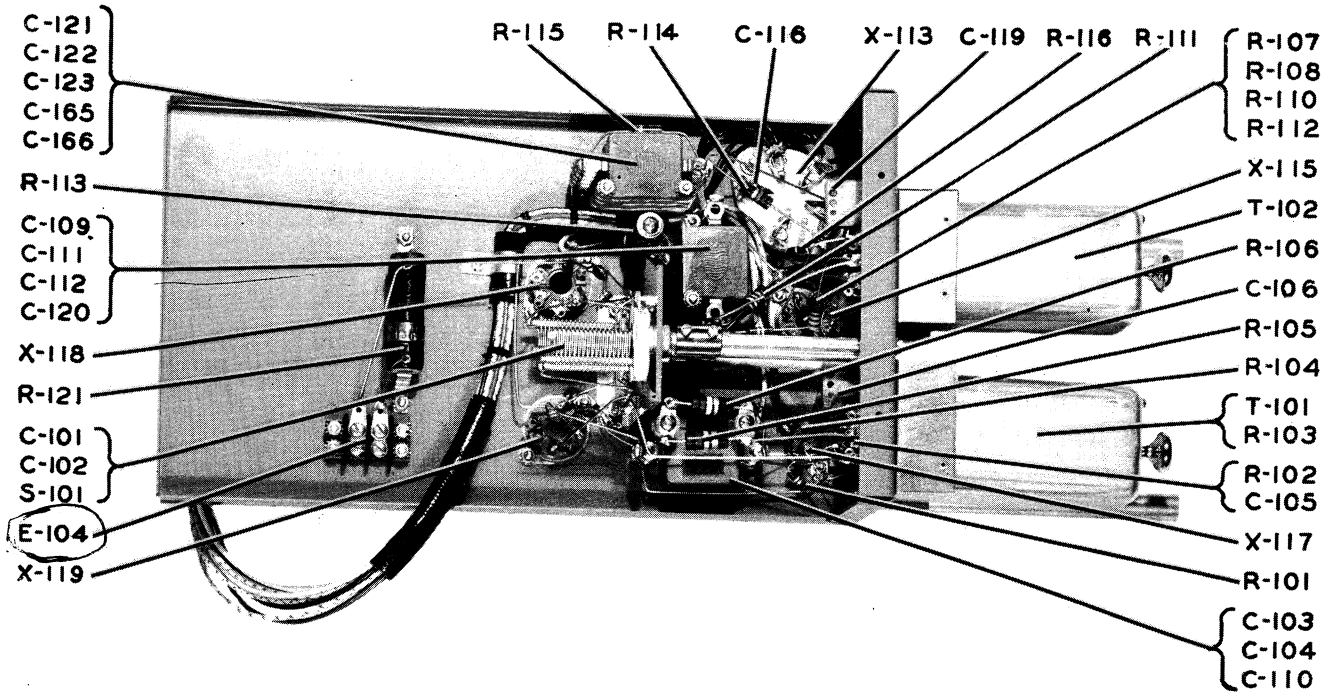


FIGURE 7-12 RF CHASSIS PARTS ARRANGEMENT, TOP VIEW



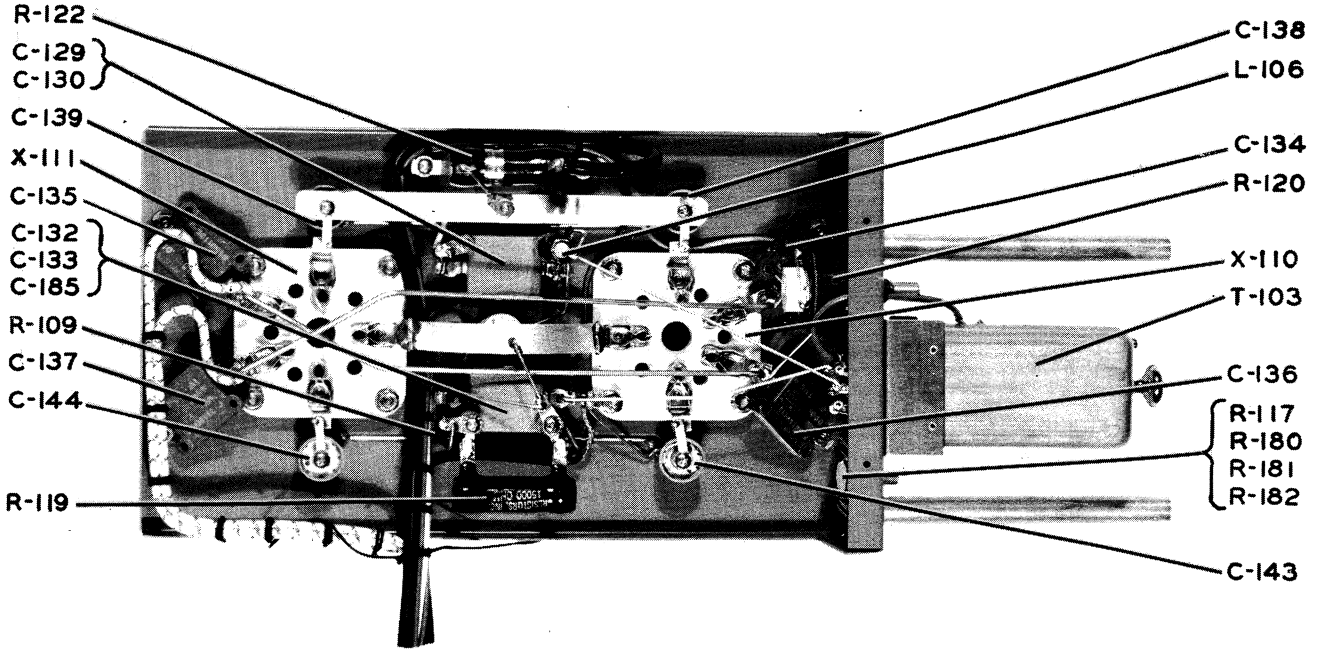


FIGURE 7-13 RF CHASSIS PARTS ARRANGEMENT, BOTTOM VIEW

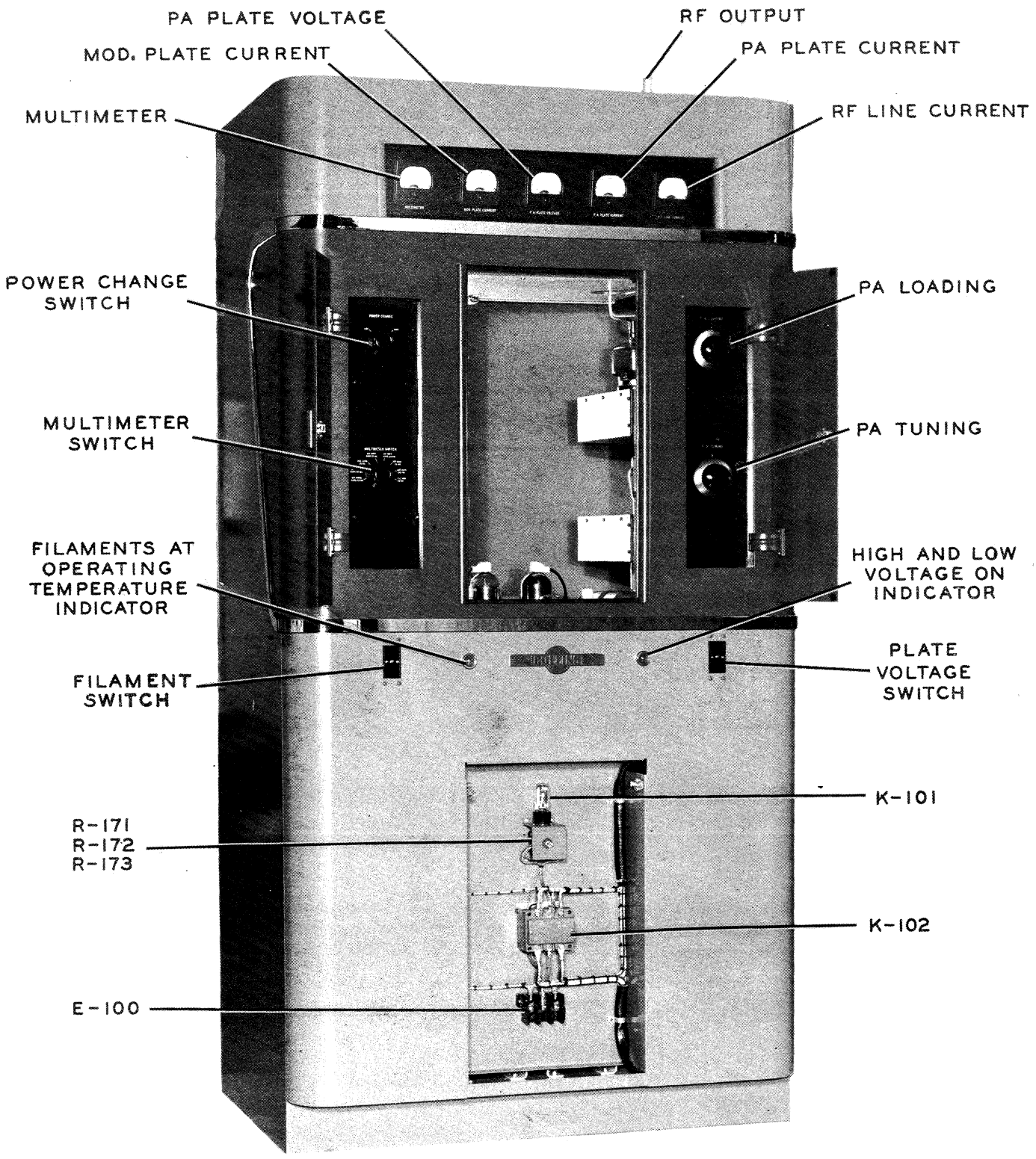


FIGURE 7-14 20V TRANSMITTER PARTS ARRANGEMENT, FRONT VIEW

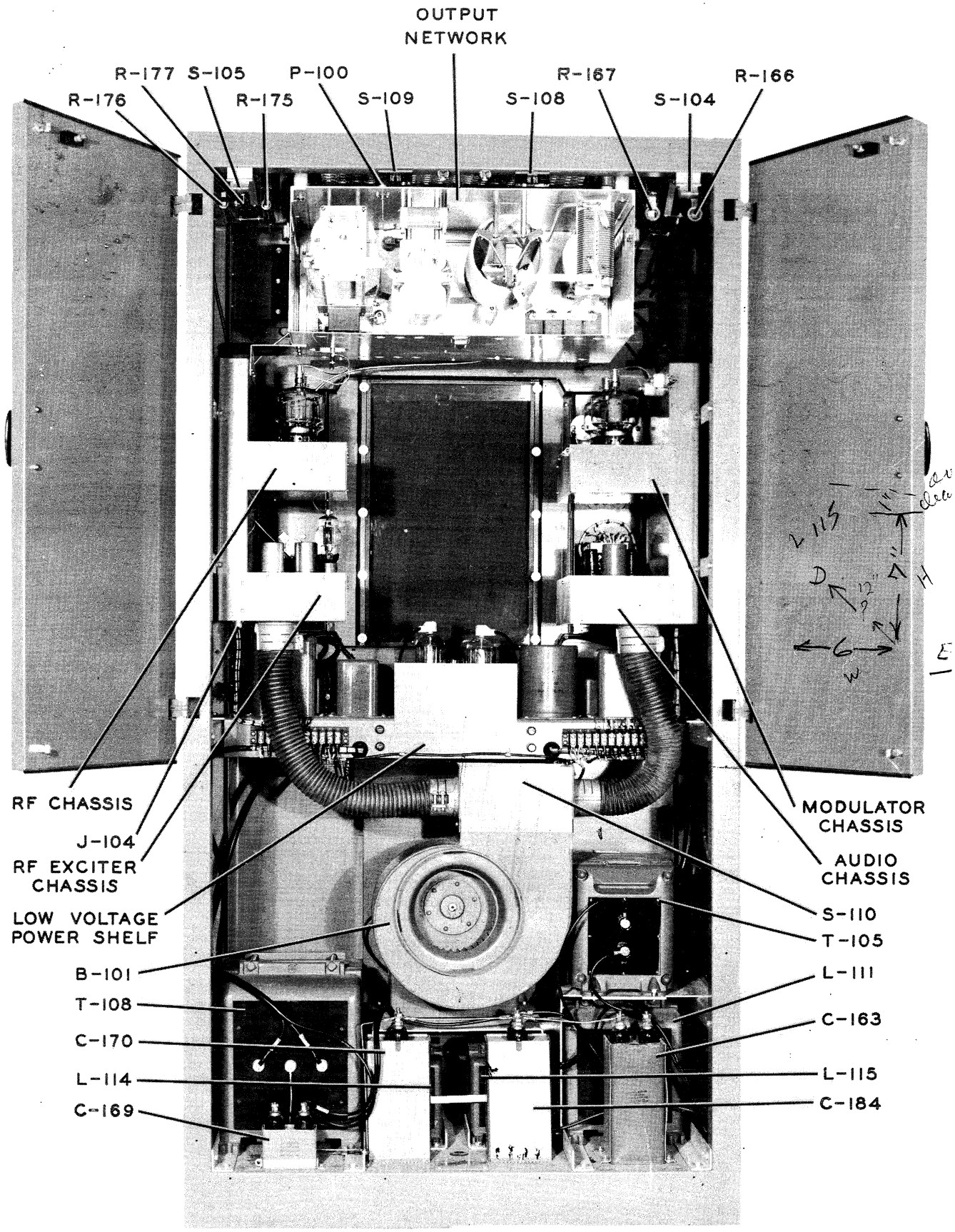


FIGURE 7-15 20V TRANSMITTER PARTS ARRANGEMENT REAR VIEW

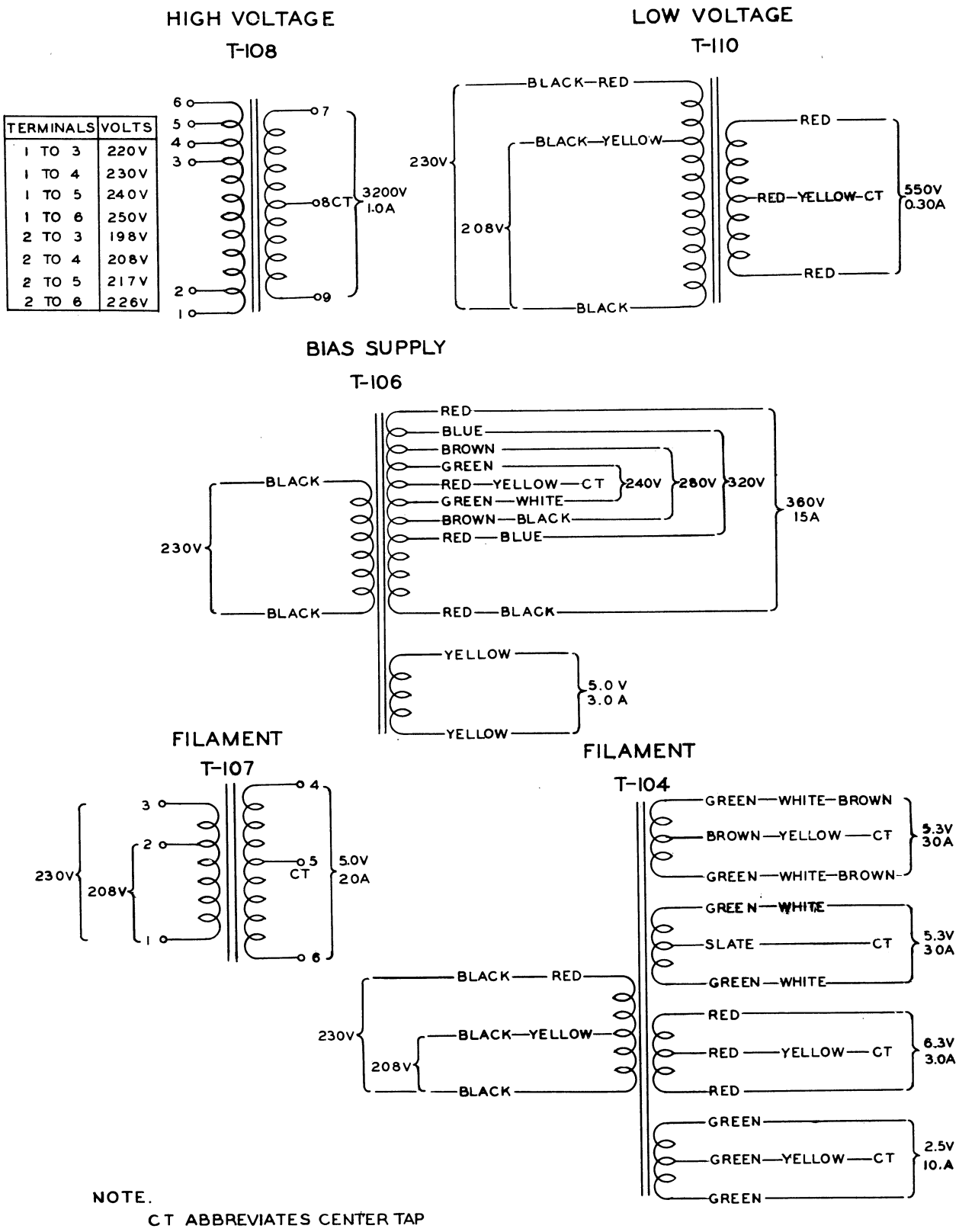


Figure 7-16. Transformer Details

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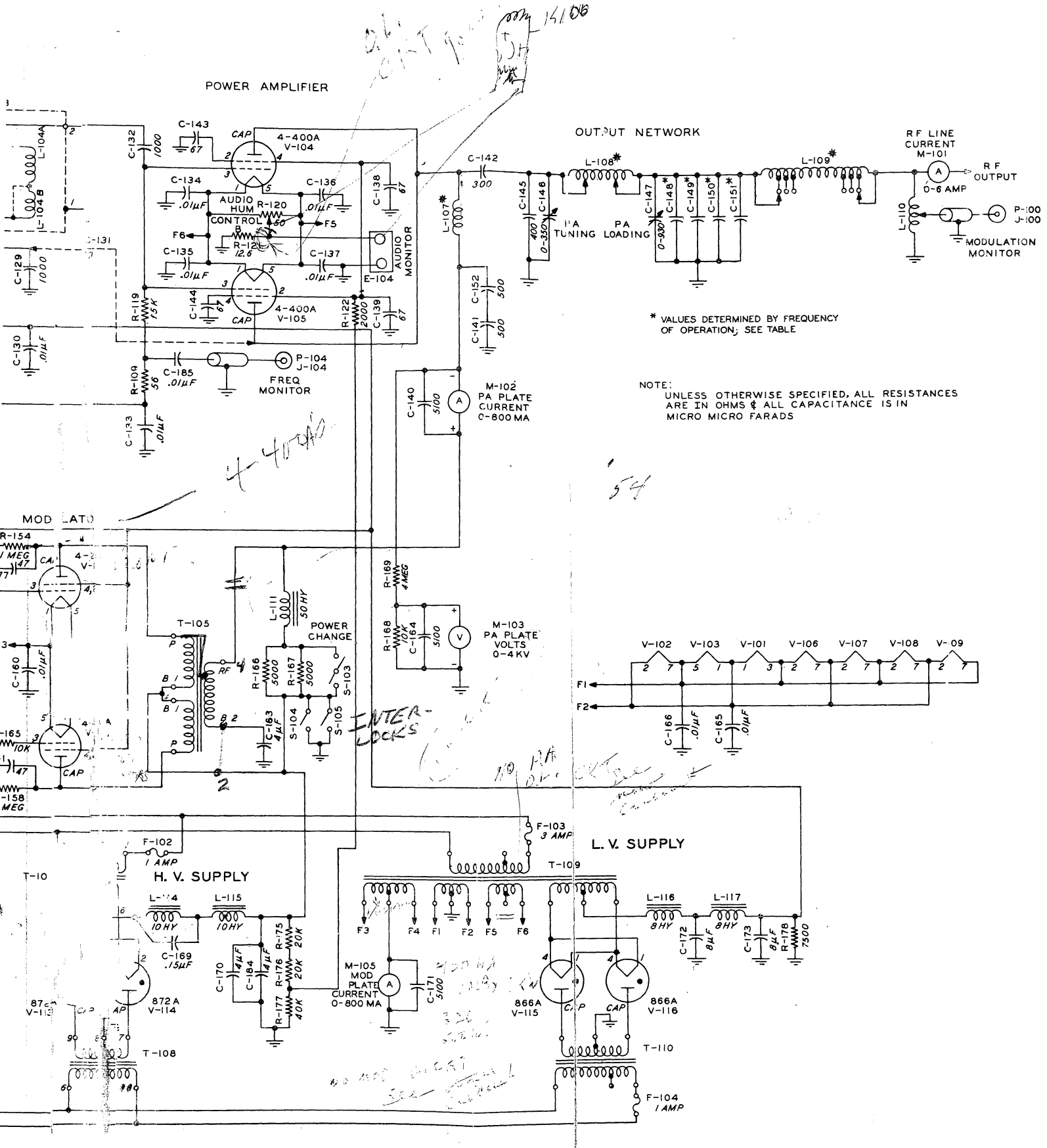


Figure 7-1. 20V Main Schematic Diagram

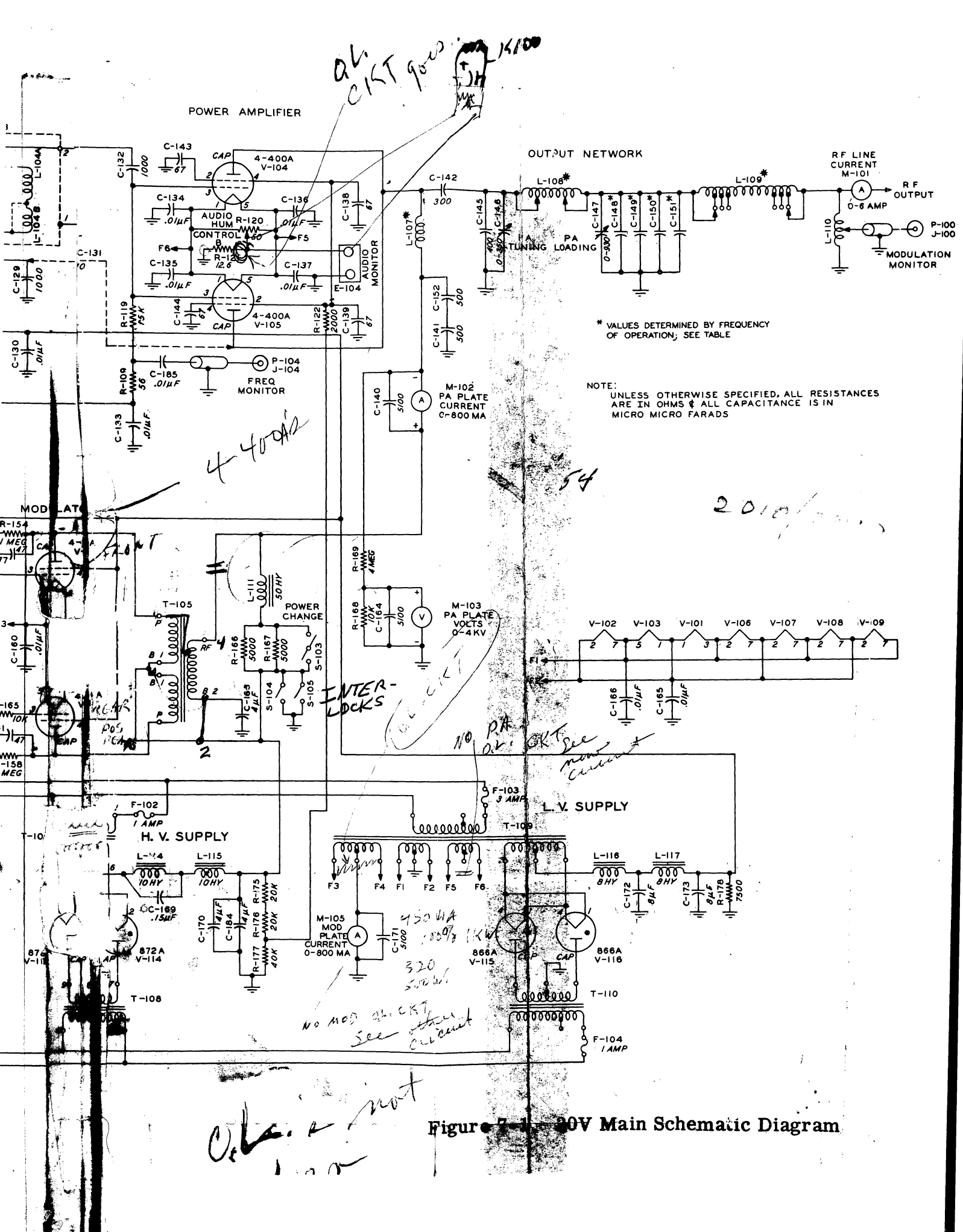
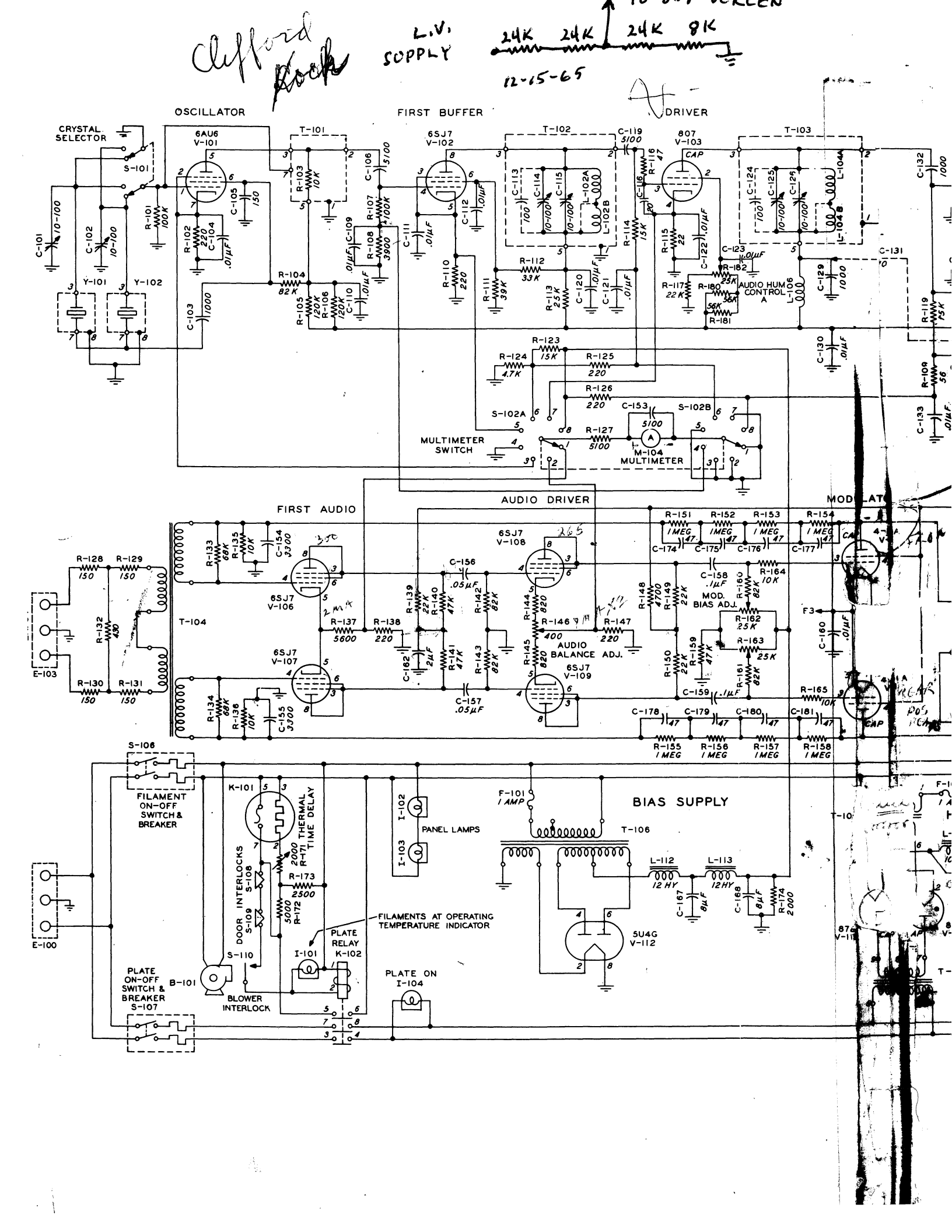


Figure 7-1. 20V Main Schematic Diagram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12-15-65
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FIRST BUFFER
DRIVER
CRYSTAL SELECTOR
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6AU6 V-101
6SJ7 V-102
807 V-103
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S-102A
S-102B
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M-104 MULTIMETER
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6SJ7 V-106
6SJ7 V-107
6SJ7 V-108
6SJ7 V-109
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C-178
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R-172
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2500
5000
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S-110
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PLATE ON-OFF SWITCH & BREAKER S-107
PLATE RELAY K-102
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I-102
I-103
I-104
PANEL LAMPS
PLATE ON
FILAMENTS AT OPERATING TEMPERATURE INDICATOR
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BIAS SUPPLY
F-101 1 AMP
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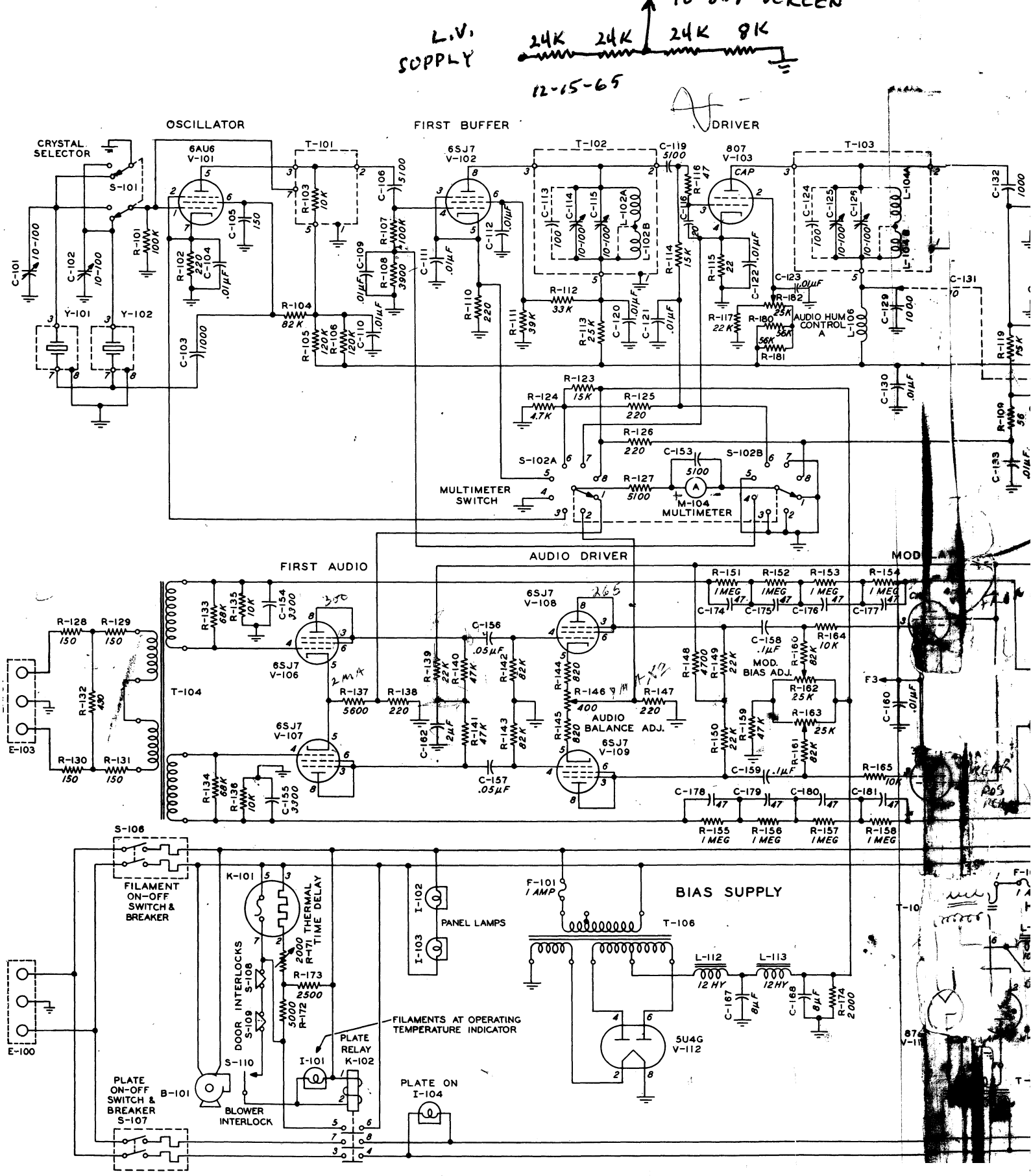
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MULTIMETER SWITCH
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M-104 MULTIMETER
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BLOWER INTERLOCK
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I-102
I-103
PANEL LAMPS
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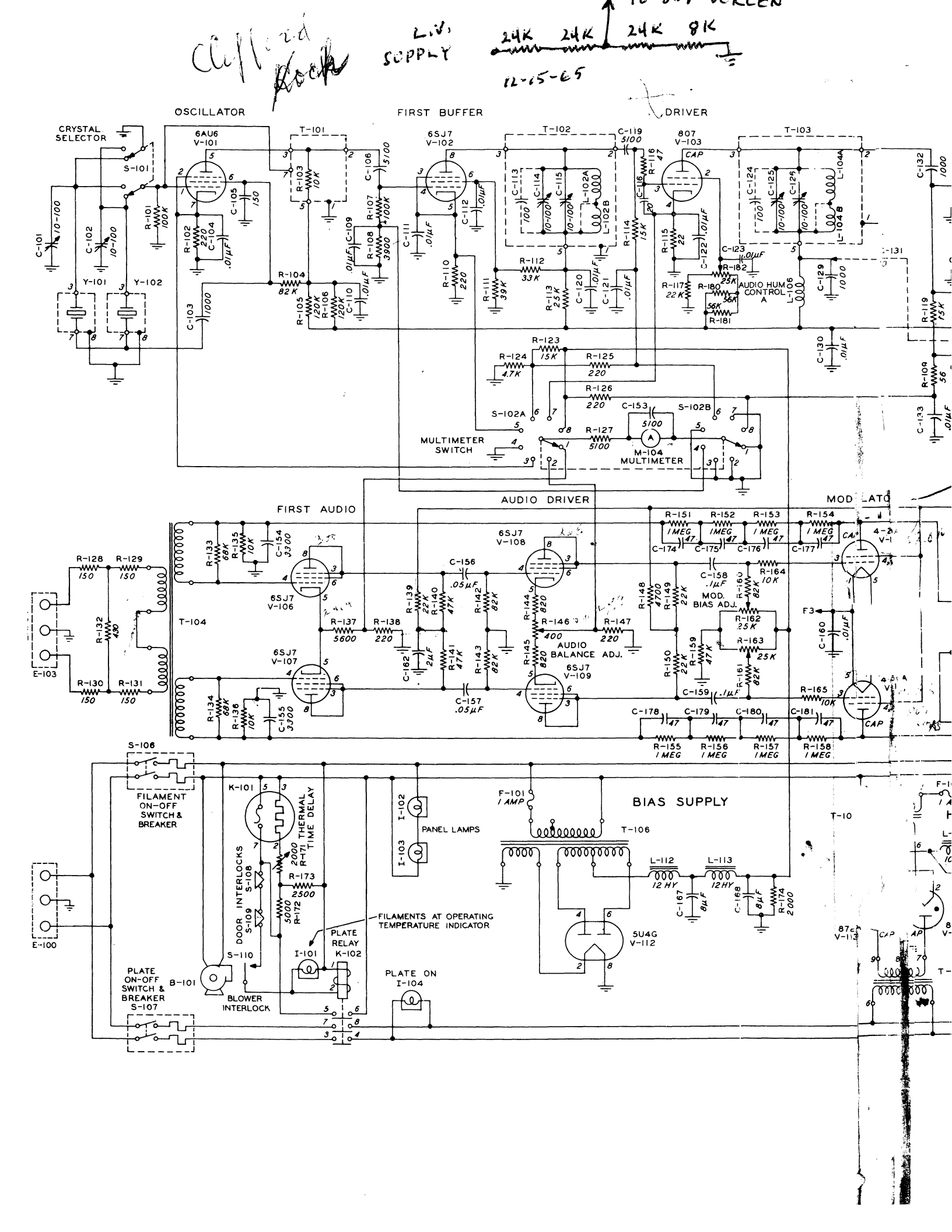
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CRYSTAL SELECTOR
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F-101 1 AMP
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L-112 12 HY
L-113 12 HY
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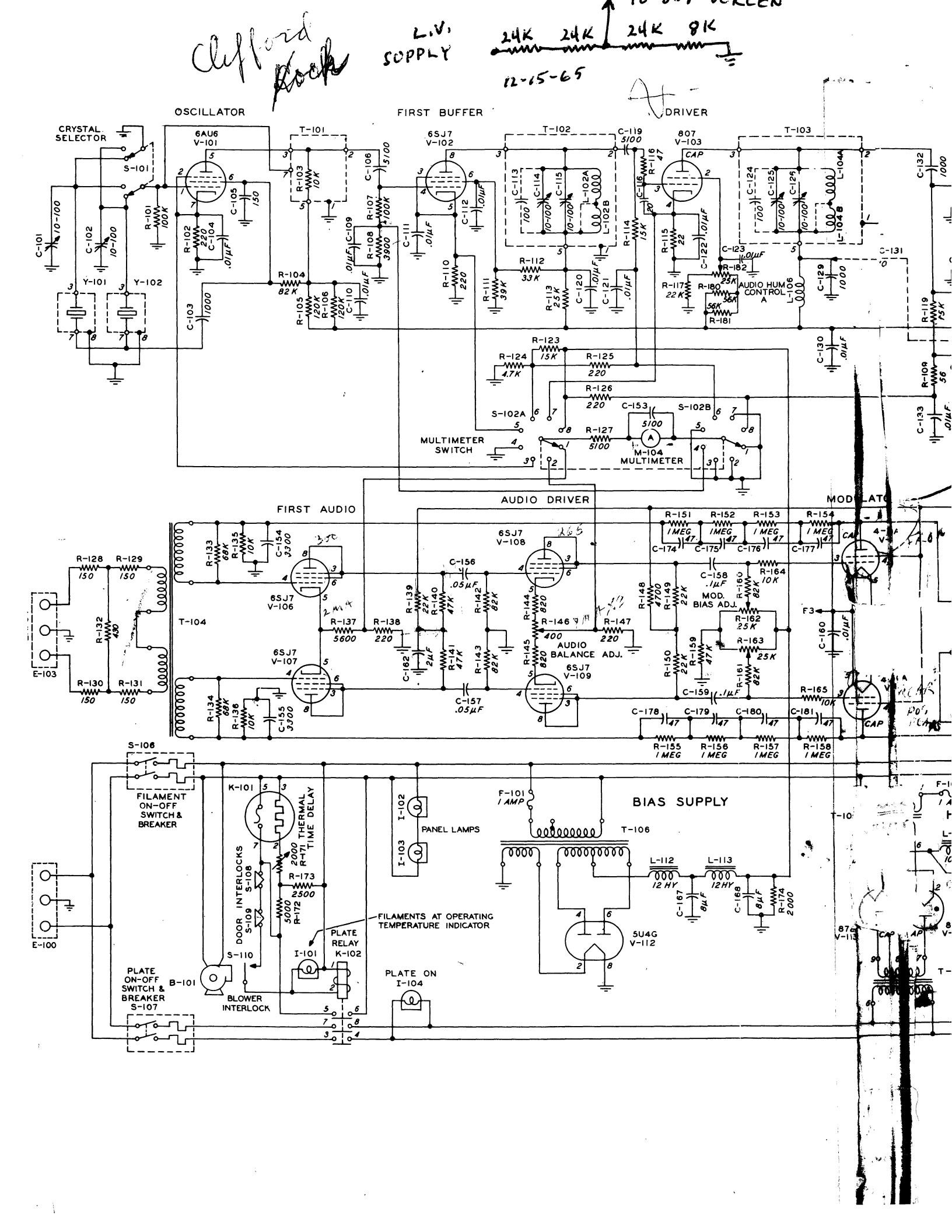
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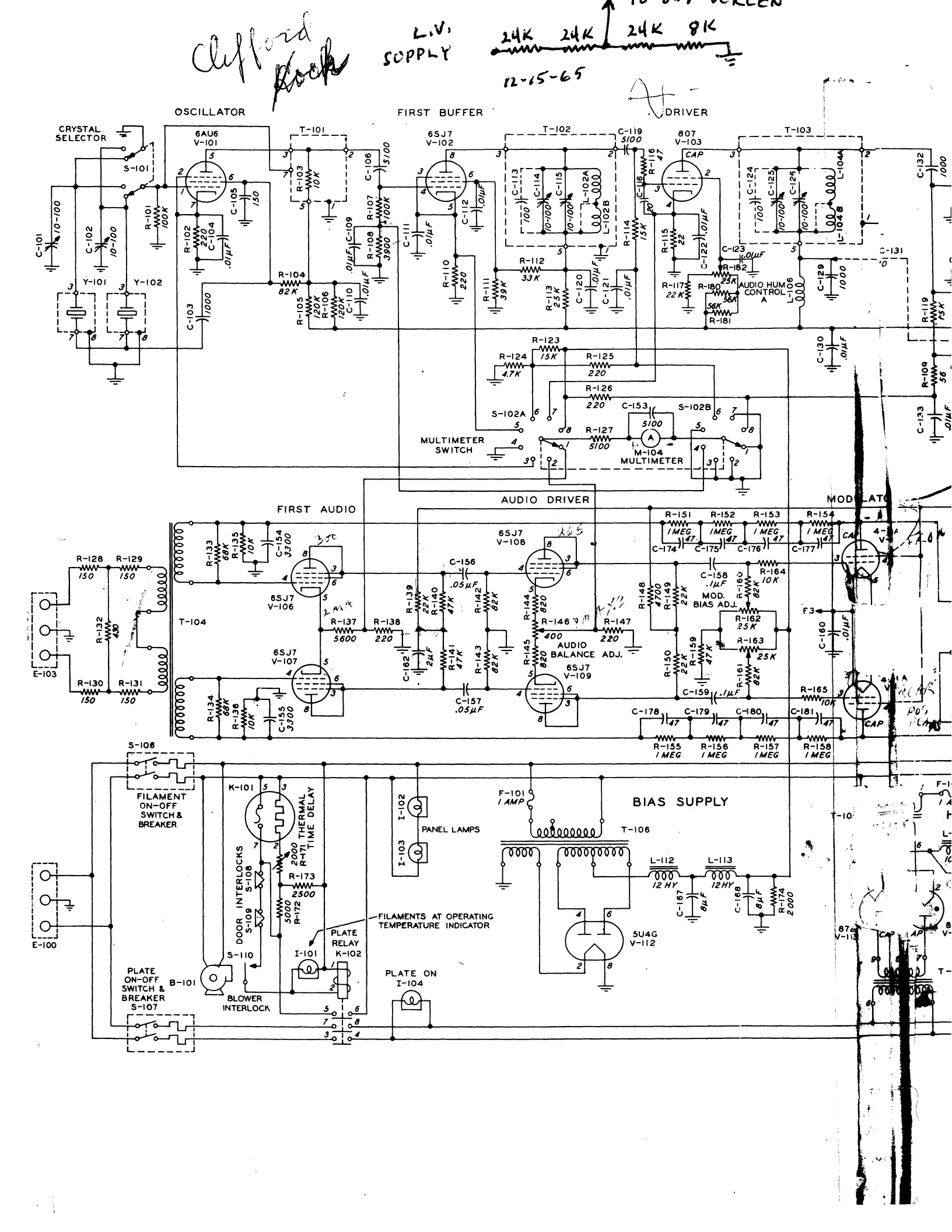
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